UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES
AND TOXIC SUBSTANCES

Note to Reader
January 15, 1998

Background: As part of its effort to involve the public in the implementation of the Food Quality Protection Act of 1996 (FQPA), which is designed to ensure that the United States continues to have the safest and most abundant food supply. EPA is undertaking an effort to open public dockets on the organophosphate pesticides. These dockets will make available to all interested parties documents that were developed as part of the U.S. Environmental Protection Agency's process for making reregistration eligibility decisions and tolerance reassessments consistent with FQPA. The dockets include preliminary health assessments and, where available, ecological risk assessments conducted by EPA, rebuttals or corrections to the risk assessments submitted by chemical registrants, and the Agency's response to the registrants' submissions.

The analyses contained in this docket are preliminary in nature and represent the information available to EPA at the time they were prepared. Additional information may have been submitted to EPA which has not yet been incorporated into these analyses, and registrants or others may be developing relevant information. It's common and appropriate that new information and analyses will be used to revise and refine the evaluations contained in these dockets to make them more comprehensive and realistic. The Agency cautions against premature conclusions based on these preliminary assessments and against any use of information contained in these documents out of their full context. Throughout this process, If unacceptable risks are identified, EPA will act to reduce or eliminate the risks.

There is a 60 day comment period in which the public and all interested parties are invited to submit comments on the information in this docket. Comments should directly relate to this organophosphate and to the information and issues available in the information docket. Once the comment period closes, EPA will review all comments and revise the risk assessments, as necessary.

These preliminary risk assessments represent an early stage in the process by which EPA is evaluating the regulatory requirements applicable to existing pesticides. Through this opportunity for notice and comment, the Agency hopes to advance the openness and scientific soundness underpinning its decisions. This process is designed to assure that America continues to enjoy the safest and most abundant food supply. Through implementation of EPA's tolerance reassessment program under the Food Quality Protection Act, the food supply will become even safer. Leading health experts recommend that all people eat a wide variety of foods, including at least five servings of fruits and vegetables a day.

Note: This sheet is provided to help the reader understand how refined and developed the pesticide file is as of the date prepared, what if any changes have occurred recently, and what new information, if any, is expected to be included in the analysis before decisions are made. **It is not meant to be a summary of all current information regarding the chemical.** Rather, the sheet provides some context to better understand the substantive material in the docket (RED chapters, registrant rebuttals, Agency responses to rebuttals, etc.) for this pesticide.

Further, in some cases, differences may be noted between the RED chapters and the Agency's comprehensive reports on the hazard identification information and safety factors for all organophosphates. In these cases, information in the comprehensive reports is the most current and will, barring the submission of more data that the Agency finds useful, be used in the risk assessments.

Jack E. Housenger, Acting Director
Special Review and Reregistration Division

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
OFFICE OF PREVENTION, PESTICIDES, AND TOXIC SUBSTANCES
WASHINGTON, D.C. 20460

January 12, 1999

MEMORANDUM

SUBJECT: The ORE aspects of the HED Chapter of the Reregistration Eligibility Decision Document (RED) for Phosmet, Case #838564, PC Code 059201, DP Barcode D236026

From: Jeff Dawson, Chemist
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The Occupational and Residential aspects of the Human Health Assessment for the Reregistration Eligibility Decision (RED) document for phosmet is attached. This chapter is based on the Hazard Identification Committee Report from George Z. Ghali, Ph.D. (Executive Secretary, Hazard Identification Committee) dated December 19, 1997. The HED Exposure SAC was also briefed concerning the assumptions used to develop various aspects of the risk assessment (Paula Deschamp also reviewed the document in detail on behalf of the SAC).

The following labels (identified by EPA Reg. No.) served as the basis for this assessment:

773-076, 773-077, 773-079, 2724-169, 2724-262, 2724-277, 2724-279, 10163-166, 10163-167, 10163-168, 10163-169, 10163-170, 10163-175, 10163-184, 28293-015, 10163-171, 10163-173, 10163-172, and 10163-227.

Additionally, the following chemical-specific data submissions (identified by MRID #) were considered in this assessment:

425958-01, 404253-01, 401223-01

Notes to Risk Assessor Concerning Significant Items

- An uncertainty factor of 300 was used in the development of this RED chapter in anticipation that an additional uncertainty factor of 3 will be retained for special sensitivity to infants and children along with the 100 representing intra- and inter-species variability (Christina, as discussed with Mike Metzger).

- Several use scenarios required that exposure factors be developed based on best professional judgement as several of the scenarios are unique or otherwise represent scenarios for which appropriate data are not available.

- Child applicator scenarios were not included in this assessment even though that population may indeed make phosmet applications. The risk picture for phosmet would not be anticipated to change greatly given the factors in both the adult and child models (i.e., based on a rangefinder calculation).

- Assumptions excerpted from the *SOPs For Residential Exposure Assessment* were used in some instances to complete handler risk assessments. These should be considered conservative in nature.

- The chemical-specific DFR data for grapes were used to assess reentry risks for low row crops which represents an extrapolation of the available data.

- Several residential postapplication exposure scenarios were assessed including the pet treatment and home garden uses for phosmet. This includes a hand-to-mouth calculation for toddlers.

- There are several other risk characterization issues related to model inputs and exposure factors that should be considered while reviewing this document. These are noted individually.

4. Occupational and Residential Exposure/Risk Characterization

Exposure data requirements are triggered based on the potential for exposure and the toxicological significance of the active ingredient. All nondietary exposure/risk assessments completed for phosmet are presented in this chapter including for those occupationally exposed and those populations exposed in a residential environment. Use patterns and available products are summarized in a manner appropriate for nondietary risk assessment in *Section 4a: Use Pattern/Available Product Summary For Exposure Assessment*. The exposure/risk assessments that have been completed for each handler and postapplication scenario, for which appropriate data exist, are included in *Section 4b: Occupational and Residential Exposure/Risk Assessment.* The characterization issues associated with, and a summary of the results of each assessment, are included in *Section 4c: Occupational and Residential Risk Characterization*.

a. Use Pattern/Available Product Summary For Exposure Assessment

Phosmet products are described in this section. Additionally, available information that describes the manner in which phosmet products are applied is provided in this section (e.g., use categories/sites, application methods, and application rates).

i. End-Use Products

Phosmet [N-(mercaptomethyl) phthalimide S-(0, 0-dimethyl phosphorodithioate)], is an organophosphate insecticide that is marketed in a variety of end-use products. Phosmet formulations include dusts, emulsifiable concentrates, wettable powders, and treated articles (i.e., flea collars). Based on a review (4/7/98) of the *Office of Pesticide Programs -- Reference Files System(REFS),* there are 81 active product labels. The distribution of these labels is as follows: 2 technical products, 18 section 3 labels, and 61 SLN labels. The following table summarizes all active section 3 labels (SLNs are not summarized for clarity and because in many cases they contain redundant use patterns -- exceptions are included and noted in the risk assessment presented in Section 4.b):

Formulation Type	Percent Active Ingredient	EPA Reg. Numbers
Dusts	5	2724-277, 10163-168, 28293-015
Emulsifiable Concentrates	5, 11.6, 11.7, 27.5	773-076, 773-079, 2724-169, 2724-262, 10163-171, 10163-173, 10163-215
Soluble Concentrate	12.4	10163-174
Wettable Powder	12.5, 50, 70	10163-166, 10163-167, 10163-169, 10163-170, 10163-175, 10163-184
Treated Articles	15	2724-279

Phosmet products are marketed for both occupational and homeowner uses. Occupational use products are intended for application in agricultural settings, to ornamentals, as direct-animal treatments, and for occupational uses in residential environments. Products intended for homeowner use are intended for direct animal treatments application, to ornamentals, and to vegetable gardens.

ii. Mode of Action and Targets Controlled

Phosmet is an organophosphate insecticide used for the control of many types of pests including:

- **On Orchard & Fruit Crops:** apple maggot, oriental fruit moth, Japanese beetle, grape berry moth;
- **On Terrestrial Food & Feed Crops:** alfalfa weevil larvae, pea aphids, boll weevil, and potato weevil on crops such as alfalfa, peas, potatoes, and cotton;
- **On Ornamentals:** gypsy moth, elm leaf beetle, Japanese beetle on deciduous shade trees and ornamentals; and
- **For Direct Animal Treatments:** lice, hornflies, sarcoptic mange, and ticks on farm animals and domestic pets.

iii. Registered Use Categories and Sites

An analysis of the current labeling and available use information was completed using the *Office of Pesticide Programs -- Label Use Information System* in addition to *REFS*. Phosmet is registered for use in a variety of occupational and homeowner/residential scenarios. For reasons of clarity, the use patterns have been described in a manner that delineates occupational from homeowner uses.

Occupational Use Sites

Occupational populations are potentially exposed while making phosmet applications to the following targets or after contact with these treated targets after previous phosmet applications:

- **Fruit Tree and Nut Tree Crops:** almond, apricot, beech nut, butternut, cashew, cherry, chestnut, citrus fruits, crabapple, filbert, grapefruit, hickory nut, kiwi fruit, lemon, macadamia nut, nectarine, orange, peach, pear, pecan, pistachio, plum, prune, and walnut;
- **Grapes**;
- **Field, Forage, Fiber, Small Fruit (i.e., blueberries), and Vegetable Crops:** alfalfa, cotton, peas (fresh and dry), potatoes, and blueberries;
- **Sweet Potatoes:** only storage dust application;
- **NonCrop Areas:** field perimeters, parks, and recreation areas;

- **Evergreens in Large Stands:** christmas tree plantations, various types of pine-tree forests;
- **Ornamentals:** deciduous shade trees, flowering trees and shrubs, evergreens, and roses;
- **Pine seedlings**;
- **Cattle:** dairy, beef, range, and feeder cattle;
- **Farm animals:** swine and cattle (dairy beef, range, & feeder); and
- **Pets:** cats and dogs.

Homeowner/Residential Use Sites

Residential and non-occupational use sites may include those labeled for indoor and outdoor homeowner applications (e.g., exposure to pets while dipping and/or dusting, and insecticide use on ornamentals), occupational uses at residential sites (e.g., insecticide use to control pests on trees, shrubs, and other ornamentals), and occupational uses at sites that may contribute to residential population exposures (e.g., pets treated at a veterinary clinic; treated ornamentals in parks, residential areas, and recreational areas; and treated Christmas-tree plantations and pine forests). Homeowner applicators and residential populations are potentially exposed while making phosmet applications (i.e., homeowner products) to the following targets or after contact with these treated targets after previous phosmet applications:

- **Homeowner Fruits, Nuts, and Ornamentals**;
- **Homeowner Vegetables:** peas (fresh and dry) and potatoes;
- **Ornamentals:** shade trees, evergreens, and roses (i.e., can include treated nonresidential areas such as parks and recreational areas);
- **Pets:** cats and dogs; and
- **Non-Residential Evergreens:** Christmas tree plantations and various types of pine-trees forests.

iv. Application Parameters

Application parameters are generally defined by the physical nature of the use site, the physical nature of the formulation (e.g., form and packaging), by the equipment required to deliver the chemical to the use site, and by the application rate required to achieve an efficacious dose. Phosmet is a broadspectrum insecticide. As such, HED has summarized application parameters for major crop groups/application targets by identifying the maximum application rates for each group and the equipment that can be used to make applications.

The crop groupings, the corresponding range of maximum application rates, and equipment that HED has identified appropriate to the scenario are presented below. These scenarios have been used by HED to define scope of the handler and postapplication exposure assessments (i.e., occupational and residential scenarios).

- **Fruit Tree and Nut Tree Crops:** The application rate for commercial crops is 1.5 to 5 lb ai per acre for most crops. Citrus rates are as high as 15 lb ai per acre. Equipment for commercial use is airblast, aerial, and chemigation.

- **Grapes:** The application rate for commercial crops is 0.9 to 1.5 lb ai per acre. Equipment for commercial use is airblast, over the row groundboom, power duster, aerial, and chemigation.

- **Field, forage, fiber, small fruit (i.e., blueberries), and vegetable crops:** The application rate for commercial crops is 0.7 to 1 lb ai per acre. Equipment for commercial use is groundboom, aerial, and chemigation.

- **Post-harvest on Sweet Potatoes**: The application rate is 0.0125 lb ai per 50 pound bushel. Commercial dusting equipment is used for applications.

- **Non Crop areas**: The application rate is 1.5 to 2.0 lb ai per acre. Equipment is groundboom and aerial (higher application rate on lower amount of acreage than other groundboom scenarios -- hence, the other scenario is the basis for this assessment).

- **Evergreens in large stands:** The application rate for commercial crops is 1 lb ai per acre. Equipment for commercial use is airblast, aerial, and high-pressure handwand. [Note: the label specifies several equipment types including compressed air sprayer, bucket-pump sprayer, slide-pump sprayer, small pump sprayer, and wheelbarrow sprayer. The high pressure handwand exposure scenario was used by HED to assess each of these equipment types -- data for each specific sprayer type is not available.]

- **Ornamentals:** The application rate for commercial crops is 0.75 lb ai per 100 gallons of water. Equipment for commercial use is low-pressure handwand, backpack, high-pressure handwand, and airblast/mist blower.

- **Pine seedling dip**. The application rate is 1.75 lb ai per 5 gallons of dip (5 gallons of dip treats 10,000 seedlings). Likely dipped by hand into an open bucket.

- **Cattle dip:** The application rate is 0.4 to 1.7 pounds ai per 100 gallons of dip. Application equipment is dip vat.

- **Farm animal spray**: The application rate is 0.4 to 2.0 lbs ai per 100 gallons of spray. Application equipment is low-pressure handwand, backpack sprayer, and high-pressure handwand sprayer.

- **Farm animal dust**: The application rate is 1/4 teaspoon (0.5 gm) formulation per lb of body weight. Application equipment is a dust bag.

- **Cattle backrubber:** The application rate is 1 lb ai per 50 gallons of fuel oil. Application equipment is backrubber, soak sack, or cloth.

- **Homeowner fruits and nuts:** The application rate for homeowner crops is 0.0098 lb ai per gallon and 10 gallons of water per tree. Equipment for homeowner is backpack, low pressure handwand, hose-end sprayer, compressed air sprayer, and small power sprayer.

- **Homeowner vegetables (peas and/or potatoes):** The application rate is 0.012 lb ai per 5 gallons per 100 square feet. Equipment for homeowner is backpack, low pressure handwand, and hose-end sprayer.

- **Homeowner ornamentals:** The application rate for homeowner crops is 0.0078 lb ai per gallon (6 tsp of one pound per gallon EC formulation per gallon of water and 3 Tbsp of 12.5% WP formulation per gallon of water). Equipment for homeowner is backpack, low pressure handwand, hose-end sprayer, compressed air sprayer, and small power sprayer.

- **Pets dust:** The application rate is 0.5 grams of formulated dust per kilogram of animal bodyweight (cats and dogs). Application equipment is shaker can.

- **Pet collar:** The application rate is 1 collar per animal and each collar contains 15% ai per collar of active ingredient (cats and dogs). Application equipment is a pet collar.

b. Occupational and Residential Exposure/Risk Assessment

HED has determined that there is a potential for exposure in both occupational and residential/homeowner scenarios from handling phosmet products during the application process (i.e., mixer/loaders, applicators, flaggers, and mixer/loader/applicators) and from entering areas previously treated with phosmet. As a result, risk assessments have been completed for both occupational handler and postapplication scenarios as well as residential handler and postapplication scenarios.

i. Calculations/Endpoints Used in the Exposure/Risk Assessment

A series of toxicological endpoints and calculations were used to complete the handler and post-application risk assessments. The specifics for calculating handler and post-application exposures differ because of the way that data for each scenario are presented. As such, the endpoints and equations that have been used to calculate exposures/risks for all scenarios are presented in this section.

Toxicological Endpoints: The endpoints that were used to complete this assessment are summarized below in order to provide a quick reference to the occupational and residential risk assessments. The toxic effect associated with all phosmet endpoints is red blood cell and serum cholinesterase inhibition.

- Short-Term Dermal: 1.1 mg/kg/day based on chronic rat study (MRID 41916401);

- Intermediate-Term Dermal: 1.1 mg/kg/day based on chronic rat study (MRID 41916401);
- Dermal Absorption: 10 percent based on rat dermal absorption study (MRID 40122201);
- Inhalation: no inhalation studies are available for use in an inhalation risk assessment -- dose combined with dermal to calculate total dose for use in risk assessment (12/19/97 HAZID);
- Uncertainty Factors: 300 for both short-term and intermediate-term scenarios (12/19/97 HAZID); and
- Cancer: group C possible human carcinogen, use Reference Dose approach for quantification of human risk (12/19/97 HAZID).

Handler Exposure/Risk: The daily dermal exposure, daily dose, and hence the risks, to handlers were calculated as described below. The first step was to calculate daily dermal exposure using the following formula:

Daily Dermal Exposure (mg ai/day) =

Unit Exposure (mg ai/lb ai) x Application Rate (lb ai/A) x Daily Acres Treated (A/day)

Where:

Daily Dermal Exposure = Amount deposited on the surface of the skin that is available for dermal absorption, also referred to as potential dose (mg ai/day);
Unit Exposure = Normalized exposure value derived from May 1997 PHED Surrogate Exposure Table or December 1997 SOPs for Residential Exposure Assessment Surrogate Exposure Table for homeowner applications, no chemical-specific handler data were available for this assessment (mg ai/pound ai applied);
Application Rate = Normalized application rate based on a logical unit treatment such as acres or on a per animal basis, a maximum value is generally used (lb ai/A or lb ai/animal); and
Daily Acres Treated = Normalized application area based on a logical unit treatment such as acres or numbers of animals (A/day or animals/day).

Daily dermal dose was then calculated by normalizing the daily dermal exposure value by body weight and accounting for dermal absorption (i.e., a biologically available dose resulting from dermal exposure). For adult handlers using phosmet, a body weight of 70 kg was used for all exposure scenarios because the toxic effect (cholinesterase inhibition) is not sex-specific. Additionally, a dermal absorption factor of 10 percent was used for all calculations. Daily dermal dose was calculated using the following formula:

$$Daily\ Dermal\ Dose\left(\frac{mg\ ai}{kg/day}\right) = Daily\ Dermal\ Exposure\left(\frac{mg\ ai}{day}\right) x \left(\frac{DermalAbsorptionFactor(\%/100)}{Body\ Weight\ (kg)}\right)$$

The next step was to calculate the daily inhalation exposure for handlers. The process used is similar to that used to calculate the daily dermal dose to handlers. Daily inhalation exposure levels were are presented as (μg/lb ai) values in the PHED Surrogate Exposure Table of May 1997 (i.e., these values are based on an inhalation rate of 29 liters/minute and an 8 hour exposure interval). Once the unit exposure value is presented in this form and converted to (mg/lb ai), the calculations essentially mirror those presented above for the dermal route using a value of 100 percent absorption (i.e., a daily inhalation

dose is calculated in mg/kg/day).

The handler exposure assessment does not include any dietary or drinking water inputs.

Finally, the calculations of daily dermal dose and daily inhalation dose received by handlers were then combined to assess the total risk to handlers for each exposure scenario. Short-term total and intermediate-term total MOEs were calculated using the same NOEL of 1.1 mg/kg/day and the formula below:

$$MOE = \frac{NOEL\left(\frac{mg}{kg/day}\right)}{Total\ Daily\ Dose\left(\frac{mg}{kg/day}\right)}$$

A margin of exposure (MOE) uncertainty factor of 300 is considered an appropriate risk level for both the short- and intermediate-term exposures to phosmet. MOE values were calculated by application of progressively increasing levels of risk mitigation for each handler exposure scenario until an appropriate risk level was obtained or risk mitigation options are exhausted.

Post-Application Exposure/Risk: The calculations used to estimate *Daily Dermal Dose* and *MOE* for the dermal post-application scenarios are similar to those described above for the handler scenarios. The only significant differences are (1) the manner in which the *Daily Dermal Dose* is calculated using a transfer coefficient, transferable residue levels, and accounting for the dissipation of phosmet over time (see the postapplication exposure assessment for further details -- in some cases, empirical data were available); (2) inhalation exposures were not calculated for the postapplication scenarios (i.e., *Total Daily Dose* in the MOE calculation only represents dose levels resulting from dermal exposures because the data do reflect inhalation exposures which have been shown, historically, to account for a negligible percentage of the overall body burden); and (3) non-dietary ingestion exposures were calculated for subpopulations where the behavior can be anticipated with relative certainty along with a calculation of associated dose from dermal exposure (e.g., infants and toddlers).

A database of chemical-specific dislodgeable foliar residue dissipation data was available and was used to complete the postapplication risk assessment (i.e., a generic expression of chemical dissipation was not required to model dissipation in the environment). Best fit transferable residue levels (i.e., dislodgeable foliar residues) were calculated based on empirical data using the equation D2-16 from *Series 875-Occupational and Residential Test Guidelines: Group B-Postapplication Exposure Monitoring Test Guidelines*. The factors for this equation were developed based on a semilog regression of empirical dissipation data for phosmet applied to three crops (pears, grapes, and oranges):

$$C_{envir(t)} = C_{envir(0)} e^{PAI_{(t)} * M}$$

Where:
$C_{envir(t)}$ = transferable residue concentration (µg/cm^2) that represents the amount of residue on the surface of a contacted leaf surface that is available for dermal exposure at time (t);
$C_{envir(o)}$ = transferable residue concentration (µg/cm^2) that represents the amount of residue on the surface of a

contacted leaf surface that is available for dermal exposure at time (0);
e =natural logarithms base function;
PAI_t = postapplication interval or dissipation time (e.g., DAT day); and
M = slope of line generated during linear regression of data [$\ln(C_{envir})$ versus postapplication interval (PAI)].

- Dermal Dose values on each postapplication exposure day were calculated using the following:

Dermal $Dose_{(t)}$ (mg/kg/day) =

($TR_{(t)}$ (μg/cm^2) x TC (cm^2/hr)x DA (%/100) x Hr/Day)/(BW (kg) x 1000 (μg/mg))

Where:
TR = transferable residue at time (t) as defined above (μg/cm^2);
TC = transfer coefficient or measure of the relationship of exposure to transferable residue concentrations while engaged in a specific mechanical activity or job function (cm^2/hour);
DA = dermal absorption (%);
Hr = exposure duration or hours engaged in specific mechanical activity (hrs);
BW = body weight (kg); and
Dermal Dose $_{(t)}$ = absorbed dose attributable to exposure at time (t) when engaged in a specific mechanical activity or job function (mg/kg/day).

Residential SOP Scenarios: In some cases, assumptions presented in the *SOPs for Residential Exposure Assessment* were used as the basis for both handler and postapplication risk assessments. These approaches are noted in the individual assessments. The following illustrates the basics of this approach, individual variations are noted as appropriate:

$$Dose = \frac{AR * (A/100) * (F/100) * (T/100)}{BW}$$

where:

Dose	=	dose resulting from dermal contact or hand-to-mouth activity (mg/kg/day);
A	=	absorption, 10 percent is used for dermal and 100 percent is assumed for nondietary ingestion (%);
AR	=	amount of active ingredient applied (lb ai);
F	=	active ingredient per day available for exposure (%);
T	=	available residue transferred due to skin contact (1 to 10 percent) or due to ingestion (100 percent) attributable to hand-to-mouth activity (%); and
BW	=	body weight (kg).

ii. Handler Risk Assessment Assumptions and Factors

A series of assumptions and exposure factors served as the basis for completing both the occupational and homeowner handler risk assessments. Each assumption is detailed below on an individual basis. These include:

- Average body weight of an adult handler is 70 kg because the NOEL used for the short- and intermediate-term assessments (1.1. mg/kg/day for both scenarios) is based on a chronic oral study and is appropriate to both male and female populations based on the toxicological effect. [Note: HED recognizes that child applicators are a plausible subpopulation for residential scenarios and that different body weights and surface areas should be used for such calculations. A rangefinder calculation using a child body weight of 39.1 kg (excerpted from the *SOPs For Residential Exposure Assessment*) indicates that the overall risk picture does not differ significantly from the adult handler scenarios. These calculations did not account for surface area differences between adults and children.]

- The average occupational workday is assumed to be 8 hours. The daily areas to be treated were defined for each handler scenario (in appropriate units) by determining the amount that can be reasonably treated in a single day (e.g., acres, number of animals, gallons throughput). Daily acres and volumes (as appropriate) to be treated in each occupational scenario include:

  -- 350 acres for non-forestry aerial and chemigation applications (including flaggers supporting aerial applications);
  -- 1,200 acres for forestry aerial applications (pine trees in the northwest are considered an acceptable model for this scenario);
  -- 80 acres for agricultural groundboom applications;
  -- 40 acres for agricultural airblast applications on fruit;
  -- 1,000 gallons for cattle dipping using a large dipping tank;
  -- large herd of cattle is 1,000 head and a small herd is 100 head for direct spray animal treatments;
  -- 1 gallon of spray per 1 animal is assumed for cattle;
  -- 1,000 gallons spray using a high-pressure/high-volume handwand device for a large herd;
  -- 100 gallons spray using a low-pressure handwand or backpack sprayers for a small herd;
  -- 8 pet animals per day for veterinary uses;
  -- 10 gallons of spray per tree and 40 trees are treated for ornamental tree applications (e.g., tree surgeons treating because of infestation or routine maintenance); and
  -- 1.25 gallons of spray per tree and 40 ornamental trees are sprayed for airblast-like applications (e.g., also referred to as mistblower tree surgeons treating because of infestation or routine maintenance).

- Occupational label scenarios specified a “hydraulic sprayer” for use on trees. HED has used both high-pressure handwand data and data for right-of-way sprayers for evaluating this label requirement. This is the general approach by HED and has been used for several years as an approach for encoding exposure data in the Pesticide Handlers Exposure Database.

- Occupational label scenarios specified a “mistblower” for use on trees. HED has used data for airblast sprayers for evaluating this label requirement. This is the general approach by HED and has been used for several years as an approach for encoding exposure data in the Pesticide Handlers Exposure Database.

- For direct pet animal treatments, a range of dog body weights range from 5 lbs (min) to 120 lbs (max) were used to calculate a “to the animal” application rates (factors obtained from

Professional's Choice Pet Products website at www.k9netwk.com). These values, coupled with the assumptions detailed above from the Residential SOPs, were used to calculate total human dose levels (i.e., "to the animal" application rates were used along with a percentage of the amount applied).

- No empirical data are available that would enable HED to quantify exposures during direct animal treatments to pets such as dogs and cats. However, the *Standard Operating Procedures (SOPs) for Residential Exposure Assessments* include assumptions for calculating these values. The assumptions excerpted from the Residential SOPs that were used in this assessment include: (1) 10 percent of the active ingredient applied during dipping, dusting, and shampooing is used to represent total dose and (2) 1 percent of the active ingredient contained in flea collars is used to represent total dose. These assumptions were used to estimate exposures during both occupational and homeowner applications of direct pet treatment products regardless of anticipated clothing scenarios (i.e., assumption can be assumed to represent both homeowner clothing and baseline occupational clothing scenarios). Further refinement of these assumptions based on clothing scenario would be inappropriate.

- Calculations are completed for a range of maximum application rates for various crop groupings in order to bracket handler risk levels associated with specific application equipment. No use data were available from BEAD or the registrant that can be used to quantify typical application rates for phosmet.

- Due to a lack of scenario-specific data, HED is often required to calculate unit exposure values using generic protection factors that are applied to represent various risk mitigation options (i.e., the use of PPE or Personal Protective Equipment and engineering controls). PPE protection factors include those representing layers of clothing (50%), chemical-resistant gloves (90%), and respiratory protection (80 to 90% depending upon mitigation selected). Engineering controls are generally assigned a protection factor of 90 percent. Engineering controls may include closed mixing/loading systems and closed cabs/cockpits.

- Risk mitigation options for occupational handlers are based on the Worker Protection Standard and the criteria established by the guidance for the Pesticide Handlers Exposure Database (i.e., extra layers of clothing, chemical-resistant gloves, respirators, closed-systems, etc.). The use of PPE and engineering controls are not considered acceptable options for mitigating risks for those products sold for use by homeowners. Additionally, the clothing scenario for homeowner handlers is based on the use of short pants and short-sleeved shirts.

- Estimates of the square feet treated in homeowner gardens include 150 $feet^2$ for potatoes and 250 $feet^2$ for peas.

- For homeowner applications using handheld equipment such as low pressure handwands or backpack sprayers, a value of 5 gallons of spray per day is used based on the guidance provided in the *SOPs For Residential Exposure Assessment*. A similar estimate has also been used for calculating risks for hose-end sprayers. In some cases, labels indicated that up to 10 gallons per tree could be applied. These scenarios were not considered plausible by HED in this assessment. [Note: An appropriate label revision is required to address the requirements for these volumes. Additionally, it appears that even if a larger volume of spray solution is used, the overall risk picture would not significantly change (see 4b and 4c for further details).]

*iii. Handler Exposure Data Source*s

No chemical-specific handler exposure data were submitted in support of the reregistration of phosmet, as a result, an exposure assessment for each use scenario was developed using surrogate values calculated by the *Pesticide Handlers Exposure Database V1.1 (PHED).* PHED data were used to complete an assessment only for those scenarios where the surrogate data were deemed appropriate by HED. PHED was designed by a task force consisting of representatives from the U.S. EPA, Health Canada, the California Department of Pesticide Regulation, and member companies of the American Crop Protection Association. PHED is a generic database containing voluntarily submitted empirical exposure data for workers involved in the handling or application of pesticides in the field (i.e., currently contains data for over 2000 monitored exposure events). The basic assumption underlying the system is that exposure to pesticide handlers can be calculated generically, based on the available empirical data, for chemicals as exposure is primarily a function of the physical parameters of handling and application process (e.g., packaging type, application method, and clothing scenario). PHED also contains the algorithms necessary for the user to complete surrogate task-based exposure assessments beginning with one of the four main data files contained in the system (i.e., mixer/loader, applicator, flagger, and mixer/loader/applicator).

Users can select data from each major PHED file and construct exposure scenarios that are representative of use patterns associated with specific chemicals. However, to add consistency to the risk assessment process, the EPA in conjunction with the PHED task force has evaluated all data within the system and developed a surrogate exposure table that contains a series of standard unit exposure values for various occupational exposure scenarios (*PHED Surrogate Exposure Guide of May, 1997*). The Surrogate Exposure Guide of May, 1997 serves as the basis for this assessment (i.e., all scenarios are occupational and there are no homeowner handler scenarios). The standard exposure values (i.e., the unit exposure values included in the exposure and risk assessment tables) are based on the "best fit" values calculated by PHED. PHED calculates "best fit" exposure values by assessing the distributions of exposures for each body part included in datasets selected for the assessment (e.g., chest or forearm) and then calculates a composite exposure value representing the entire body. PHED categorizes distributions as normal, lognormal, or in an "other" category. Generally, most data contained in PHED are lognormally distributed or fall into the PHED "other" distribution category. If the distribution is lognormal, the geometric mean for the distribution is used

in the calculation of the "best fit" exposure value. If the data are an "other" distribution, the median value of the dataset is used in the calculation of the "best fit" exposure value. As a result, the surrogate unit exposure values that serve as the basis for this assessment generally range from the geometric mean to the median of the selected dataset.

There are three basic risk mitigation approaches considered appropriate for controlling occupational exposures. These include administrative controls, the use of personal protective equipment or PPE, and the use of engineering controls. Occupational handler exposure assessments are completed by HED using a baseline exposure scenario and, if required, increasing levels of risk mitigation (PPE and engineering controls) to achieve an appropriate margin of exposure or cancer risk. [Note: Administrative controls available generally involve altering application rates for handler exposure scenarios. These are typically not utilized for completing handler exposure assessments because of the negotiation requirements with registrants.] The baseline clothing/PPE ensemble for occupational exposure scenarios is generally an individual wearing long pants, a long-sleeved shirt, no chemical-resistant gloves (there are exceptions pertaining to the use of gloves and these are noted), and no respirator. The first level of mitigation generally applied is PPE. As reflected in the calculations included herein, PPE involves the use of an additional layer of clothing, chemical-resistant gloves, and a respirator. The next level of mitigation considered in the risk assessment process is the use of appropriate engineering controls which, by design, attempt to eliminate the possibility of human exposure. Examples of commonly used engineering controls include closed tractor cabs, closed mixing/loading/transfer systems, and water-soluble packets.

iv. Occupational Handler Risk Assessment

HED has determined that exposure to pesticide handlers is likely during the occupational use of phosmet in a variety environments including agriculture, commercial/industrial premises, and in residential environments. The anticipated use patterns and current labeling indicate 19 major occupational exposure scenarios based on the types of equipment and techniques that can potentially be used to make phosmet applications. These 19 scenarios serve as the basis for the quantitative exposure/risk assessment developed for occupational handlers. These scenarios include:

(1a) mixing/loading liquids to support livestock spraying;
(1b) mixing/loading liquids to fill/recharge diptank for livestock;
(2a) mixing/loading liquids for an airblast sprayer;
(2b) mixing/loading liquids for a high pressure handwand and right-of-way sprayer applications;
(3a) mixing/loading wettable powders for aerial and chemigation application;
(3b) mixing/loading wettable powders for aerial applications;
(3c) mixing/loading wettable powders for groundboom applications;
(3d) mixing/loading wettable powders for airblast sprayer applications;
(3e) mixing/loading wettable powders for high pressure handwand and right-of-way sprayer applications;
(3f) mixing/loading wettable powders for pine seedling dips;
(4) applying sprays with an airblast sprayer;
(5) applying sprays with a groundboom sprayer;
(6) applying sprays with a fixed-wing aircraft;
(7) applying sprays with a helicopter;
(8) applying using a fill-recharge diptank for livestock;

(9) applying with a high-pressure handwand;
(10) applying with a right-of-way sprayer;
(11) dipping pine seedlings;
(12) applying with a power duster;
(13) dusting an animal (veterinary and livestock uses);
(14) dipping a dog;
(15) mixing/loading/applying with a cattle backrubber;
(16) using a dog collar;
(17a) mixing/loading/applying liquids with a backpack sprayer;
(17b) mixing/loading/applying wettable powders with a backpack sprayer;
(18a) mixing/loading/applying liquids with a low pressure sprayer;
(18b) mixing/loading/applying wettable powders with a low pressure sprayer; and
(19) flagging for aerial spray application.

The risk assessment that has been completed for the occupational handler scenarios is presented in Appendix A, Tables 1 through 4. HED anticipates that occupational phosmet exposures will only occur in a short-term or intermediate-term pattern. HED anticipates that occupational exposures will not be chronic because HED defines chronic exposures as use of the chemical for approximately 180 days per year and it is anticipated that phosmet as with other typical pesticide compounds will not be used in this manner. [Note: Readers are cautioned to consider the merits of each exposure scenario when reviewing these tables as risk mitigation options are not universally applicable in all settings (e.g., open cab aerial applications are not considered feasible or engineering controls are not feasible for some handheld application equipment). Additionally, a 15 lb ai/A application rate exists for citrus that is applicable in many exposure scenarios. This rate is not included in the handler exposure tables -- see values and footnotes on individual tables and the risk characterization provided in Section 4.c for further explanation.]

Table 1 in Appendix A presents the MOEs for the baseline mitigation level. This table includes all of information required to calculate these MOEs such as the dermal and inhalation unit exposures for each occupational handler exposure scenario at a baseline level of mitigation (i.e., a single layer of clothing -- long-pants and long-sleeved shirts; no chemical resistant gloves -- there are some exceptions based on the available empirical data that are individually noted; and no respiratory protection). Table 1 also contains the exposure factors that were used to calculate risks including an appropriate range of application rates specific to the application method and a value of daily treated that is reflective of the amount of phosmet that can be used in a single working day based on the job function (e.g., acres per day). MOEs were calculated using the total dose level and the same toxicological endpoint for both short- and intermediate-term exposure scenarios as indicated by the HAZID document (1.1 mg/kg/day). As a result, only a single MOE value is presented to represent both short- and intermediate-term exposure scenarios. The uncertainty factor established by the HAZID is 300. If MOEs for any scenario exceeded 300 the risk assessment is considered complete for that scenario (i.e., the risk mitigation level is not increased).

In cases where the risk assessment indicated an unacceptable level of risk at the baseline clothing scenario (i.e., MOE <300), HED applied varying levels of mitigation to each scenario until either an acceptable level of risk was attained or an exhaustive level of risk mitigation was applied and an acceptable level of risk could not be attained. Tables 2 and 3 in Appendix A include the risk assessments

that were completed for phosmet at increasing levels of risk mitigation. As indicated above in *Section 4.b.iii*, risk mitigation options used by HED for occupational pesticide handlers include (1) the use of PPE (Personal Protective Equipment) that includes an additional layer of clothing, chemical resistant gloves, and respiratory protection; and (2) the use of appropriate engineering controls. The risk assessment completed for handlers using PPE is presented in Table 2. The risk assessment completed for handlers using engineering controls is presented in Table 3. The format of these tables is similar to Table 1. The only differences are the unit exposure values that represent different levels of risk mitigation.

Table 4 in Appendix A summarizes the caveats and parameters specific to the data used for each exposure scenario. These caveats include descriptions of the source of the data and an assessment of the overall quality of the data. Generally, the assessment of data quality is based on the number of observations and the available quality control data. Quality control data are assessed based on a grading criteria established by the PHED task force and the reliability of any assumptions excerpted from the *SOPs for Residential Exposure Assessment* when it is appropriate. Additionally, it should be noted that all calculations were completed based on current HED policies pertaining to the completion of occupational and residential exposure/risk assessments (e.g., rounding, exposure factors, and acceptable data sources).

v. Homeowner Handler Risk Assessment

HED has determined that residential and other non-occupational handlers are likely to be exposed during phosmet use in a variety of residential settings. The anticipated use patterns and current labeling indicate several major exposure scenarios based on the types of equipment that potentially can be used to make phosmet applications. These scenarios include:

(1) dusting a dog;
(2) dipping a dog;
(3) applying a dog collar;
(4) mixing/loading/applying with a backpack sprayer;
(5) mixing/loading/applying with a low pressure handwand; and
(6) mixing/loading/applying with a garden hose-end sprayer.

The risk assessment that has been completed for homeowner and other non-occupational handler scenarios is presented in Appendix A, Tables 5 and 6. HED anticipates that homeowner handler exposures will occur only in a short-term pattern. HED anticipates that homeowner handler exposures will not be intermediate-term or chronic because HED defines intermediate-term exposures as repeated exposure events over weeks to several months and it is anticipated that phosmet as with other typical pesticide compounds will not be used in this manner. Likewise, HED believes that chronic exposures will not occur since chronic exposures are defined as use of the chemical for approximately 180 days per year and it is anticipated that phosmet like other typical pesticide compounds will not be used in this manner, particularly by homeowners.

Table 5 in Appendix A presents the dermal and inhalation unit exposures for each homeowner handler exposure scenario that HED has calculated based on the use of a clothing scenario that would be anticipated for homeowners (i.e., short-pants and short-sleeved shirts), no chemical resistant gloves (i.e., there are some extrapolations of the empirical data that required back calculation from a gloved hand scenario to a bare-handed exposure scenario), and no respiratory protection. Table 5 also contains the exposure factors that were used to calculate risks including an appropriate range of application rates specific to the application method and a value of daily treated that is reflective of the amount of phosmet that can be used in a single day in a homeowner scenario (e.g., gallons per day). Margins of exposure (MOE) were calculated for every scenario using the total dose level and the toxicological endpoint for both short-term exposure scenarios as indicated by the HAZID document (1.1 mg/kg/day). The uncertainty factor established by the HAZID is 300.

Table 6 in Appendix A summarizes the caveats and parameters specific to the data used for each exposure scenario. These caveats include descriptions of the source of the data and an assessment of the overall quality of the data. Generally, the assessment of data quality is based on the number of observations and the available quality control data. Quality control data are assessed based on a grading criteria established by the PHED task force and the reliability of any assumptions excerpted from the *SOPs for Residential Exposure Assessment* when it is appropriate. Additionally, it should be noted that all calculations were completed based on current HED policies pertaining to the completion of occupational and residential exposure/risk assessments (e.g., rounding, exposure factors, and acceptable data sources).

vi. Data Sources For Postapplication Risk Assessment

HED considered both occupational and residential postapplication exposure scenarios in this risk assessment. Two chemical-specific studies were submitted to support the reregistration of phosmet that were generated to quantify dislodgeable foliar residues in various crops (i.e., grapes, pears, and citrus) and to assess homeowner exposures during pear tree harvesting and maintenance activities. The review of these studies also triggered the development of other documents that are described below. Along with the chemical-specific data, the *Standard Operating Procedures (SOPs) For Residential Exposure Assessment (12/11/97 Version)* developed by the OPP/HED Residential Exposure Assessment Workgroup and guidance provided in *Series 875-Occupational and Residential Test Guidelines: Group B-Postapplication Exposure Monitoring Test Guidelines* were used to complete various aspects of this risk assessment. The use of specific data sources is noted as appropriate.

The chemical-specific studies submitted to support the reregistration of phosmet can be identified by the following information:

- ***Dislodgeable Residue Dissipation and Reentry Interval Calculations For Crops Treated With Products Containing Phosmet:*** Submitted by Stauffer (now Zeneca) Chemical Company; Study Completion Date: 10/22/86; Report Date: 1/16/87; Authors: Dick Knarr, Yutaka Iwata, and Kay Curry; EPA MRID 404253-01.

- ***Homeowner Exposure to Phosmet While Performing Typical Activities with Imidan Insecticide-Treated Fruit Trees:*** Submitted by Stauffer (now Zeneca) Chemical Company; Study Completion Date: 10/22/86; Report Date: 12/19/86; Authors: Dick Knarr and Yutaka Iwata; EPA MRID 401223-01.

These studies were reviewed by the Agency in 1991. The review indicated that these studies were considered acceptable to the Agency based on the review criteria appropriate for that era. The review can be identified by the following information:

- ***Review of Postapplication/Reentry Data Submitted to Support the Reregistration of Phosmet and Revision of Data Required by the 8/30/91 DCI for Phosmet (HED Project # 9-0839):*** A memo from Peg Perreault of the former Occupational and Residential Exposure Branch of HED to Lois Rossi, Special Review and Reregistration Division.

This document is a review of the data included in MRIDs 401223-01 and 404253-01. Release of this review memo from the agency to the registrants prompted two additional chemical-specific submissions including:

- ***Phosmet Dermal Passive Dosimetry Exposure Addendum to MRID 404253-01:*** Submitted by the Gowan Company, Yuma Arizona; Completion Date: 12/8/92; Author: E. Codrea; EPA MRID 425958-01 (submitted with 12/14/92 letter described below).

- ***Letter from Gowan Company, Yuma Arizona to Ms. Brigid Lowery of EPA/OPP/SRRD (Phosmet CRM) Dated December 14, 1992:*** Author: Elizabeth Codrea, Regulatory Product Manager; EPA MRID 425958-00.

Appendix B includes tables that summarize the data generated in these studies used in the development of the postapplication risk assessment (MRID 404253-01). Tables 1 through 3 present the dislodgeable foliar residue data that were generated on oranges (Table 1), pears (Table 2), and grapes (Table 3). Table 4 presents the dermal exposure data developed in MRID 401223-01. In order to better understand the data presented in Tables 1 through 4, a brief summary of these studies and accompanying correspondence is presented along with any other explanations of the data as required.

MRID 404253-01: Dislodgeable foliar residue levels were quantified from three crops (oranges, pears, and Zinfandel variety grapes) that were selected by the investigators to represent the crops for which phosmet is registered. The Iwata leaf punch/aqueous surfactant method was used to collect all samples. A 1 inch diameter punch was used in all cases and 48 punches were collected in each sample for a total double sided surface area per sample of 480 cm^2. Based on sample surface area and the available recovery data (i.e., a low fortification level of 1μg/sample), the limit of quantification was defined as 0.002 $\mu g/cm^2$ (i.e., this applies to both phosmet and phosmet oxon residue levels that were both screened for). All field samples collected in this study were above the limit of quantification. Phosmet, formulated as Imidan 50-WP, was used to make all applications. All study sites were located in California. Oranges, selected to represent citrus crops, were treated at an application rate of 15 lb ai/acre which is the current label maximum for citrus fruits. Pears, representing the remaining tree fruits and nut crops, were treated at an application rate of 5 lb ai/acre which is the current label maximum for other tree crops. Grapes, representing the remaining crops were treated at an application rate of 1 lb ai/acre which is close to the

maximum application rate for various low row crops and for grapes.

Oranges: Imidan 50-WP Insecticide was applied to a commercial orange grove located outside of Visalia, in the San Joaquin Valley of California. Imidan 50-WP was applied once using an airblast sprayer at a rate of 15 lbs ai/acre. Samples were collected on days 0, 1, 3, 5, 7, 10, 14, 21, and 28 days postapplication. Weather conditions were typical, and no rainfall was reported during the study. Based on the labeling information for oranges, the high application rate is 15 lb ai/acre, the preharvest interval is 7 days, the minimum interval between applications is 30 days, and the maximum number of applications per season is 3. The dissipation data for oranges are presented in Table 1 of Appendix B. Only field recovery data were generated in this aspect of the study. Field recovery for phosmet was 84.4 percent (CV 15.6, n = 18) while field recovery for phosmet oxon was 89.6 percent (CV 15.7, n=18). The residue levels presented in Table 1 were not apparently corrected for recovery by the investigators.

Pears: Imidan 50-WP was applied to a commercial, established planting of Bartlett pears located near Walnut Grove, California. Imidan 50-WP was applied once using an airblast sprayer at a rate of 4.8 lb ai/acre. Samples were collected on days 0, 1, 2, 3, 4, 5, 7, 10, 14, 21, and 28 days postapplication Weather conditions were typical, and no rainfall was reported during the study. Based on the labeling information for pears and other tree crops (outside of citrus), the high application rate is 5.0 lb ai/acre, the preharvest interval is 7 days, and phosmet can be applied as needed. The dissipation data for pears are presented in Table 2 of Appendix B. Field and laboratory recovery data were generated in this aspect of the study. Field recovery for phosmet was 82.5 percent (CV 9.3, n = 8) while field recovery for phosmet oxon was 93.2 percent (CV 6.9, n=10). Laboratory recovery for phosmet was 89.4 percent (CV 6.7, n = 7) while laboratory recovery for phosmet oxon was 95.1 percent (CV 5.0, n=7). The residue levels presented in Table 2 were not apparently corrected for recovery by the investigators.

Grapes: Imidan 50-WP was applied to a commercial, established planting of Zinfandel grapes located near Lodi, California. Pesticide was applied by an airblast sprayer at a rate of 0.94 lbs ai/acre. One application was made. Samples were collected on days 0, 1, 3, 4, 6, 9, 13, 20, and 27 days postapplication Weather conditions were typical during the study (i.e., no unusual events). Based on the labeling information for grapes and other crops, the high application rate is 1.5 lb ai/acre, the preharvest interval is 7 days, and phosmet can be applied as needed between egg hatch and pupation for leaffolder, leafroller, and western grape skeletonizer. The dissipation data for grapes are presented in Table 3 of Appendix B. Field and laboratory recovery data were generated in this aspect of the study. Field recovery for phosmet was 96.9 percent (CV 6.4, n = 7) while field recovery for phosmet oxon was 98.0 percent (CV 5.2, n=9). Laboratory recovery for phosmet was 90.2 percent (CV 7.9, n = 5) while laboratory recovery for phosmet oxon was 93.8 percent (CV 10.6, n=5). The residue levels presented in Table 3 were not apparently corrected for recovery by the investigators.

These data were analyzed by HED for use in the risk assessment by completing a semi-log regression and a pseudo-first order kinetics calculation of half-life as is described in the *Calculations* chapter (Part D, Chapter 2) of the draft *Series 875-Occupational and Residential Exposure Test Guidelines, Group B-Postapplication Exposure Monitoring Test Guidelines.* The data were not corrected for recovery in any calculation by HED and it appears that the data were not corrected by the investigators. The same datapoints were used by HED in the development of this risk assessment as were used by the investigators in the addendum submission to this document described below. Analysis of the data can be summarized by the following:

Crop	Application Rate (lb ai/A)	Correlation Coefficient	Slope	C_0 ($\mu g/cm^2$)	Half-Life (days)
Oranges	15	0.96913	-0.01710	12.00	40.5
Pears	5	0.97905	-0.06621	5.04	10.5
Grapes	1	0.94075	-0.06810	1.70	10.2

Slope and C_0 can be used to calculate best fit concentration levels using the equation: $C_t = C_0 * \exp^{(\text{Postapplication interval (days)} * \text{slope})}$

MRID 401223-01: The homeowner postapplication dermal and inhalation exposure study of phosmet formulated as Imidan 50-WP was conducted in pear orchards in conjunction with the DFR study of pear dissipation included in MRID 40425301 (i.e., one application at 4.8 lbs ai/acre and no rainfall). Exposures were monitored using passive dosimetry. The Durham and Wolfe patch method was used to quantify dermal (nonhand) exposure, gloves were used to quantify hand exposures (limited ethanol handwash samples were also collected to assess relative differences between methods), and personal sampling pumps were used to quantify inhalation exposure (PVC filter and XAD resin tube). Dermal (nonhand) dosimeters (5.6 cm diameter exposed orifice) were attached to a coverall at 10 locations to measure total deposition exposure levels (i.e., "naked man") including: both shoulders, both palmar forearms three inches above the wrists, right chest just above the pocket, left back at the shoulder blade, the front of both thighs, and both shins. In addition, one dosimeter was attached to the front of a cap and two were attached to a tee shirt worn beneath a coverall.

Exposures were monitored on several days postapplication (i.e., 0, 1, 2, 3, 4, 5, 7, and 14). Two test subjects completed all replicates in this study. Four replicates were completed on each day except for Day 14 when only 2 replicates were completed for a total of 30 exposure monitoring replicates in this study. The duration of each replicate was approximately 30 minutes. The activities that were monitored in each event were intended to simulate the activities of a homeowner maintaining pear trees. In each 30 minute replicate, the test subjects picked the pears from one side of a tree and dropped them to the ground (15 minutes) and then moved from tree to tree, inspected them, and removed dead branches and leaves as a homeowner might (additional 15 minutes). Higher branches were picked from a ladder as required.

Field and laboratory recovery data were generated in this study. Average field recovery values for all matrices were greater than 80 percent and the level of precision was acceptable as coefficients of variation for all media were less than 10. Laboratory recovery results were similar indicating that little or no phosmet loss occurred during the field sampling aspect of this study. Field and laboratory

recovery samples were fortified with phosmet and phosmet oxon at residue levels ranging from 1.0 μg to 200.0 μg per sample. The limits of detection (μg/sample) reported by the investigators, for each matrix, are as follows: 5.0 - dermal patches; 5.0 - gloves; 0.5 - XAD resin tubes; 0.5 - PVC filters; and 1 - ethanol handwashes.

The results for this study are summarized in Table 4 of Appendix B (22.8 mg phosmet/hour average exposure rate). The exposure data presented in Table 4 represent total deposition exposures. This particular scenario represents a plausible exposure scenario as homeowners likely would complete yard and tree maintenance wearing only shorts. Phosmet oxon was not identified in any sample. "All inhalation exposure samples had non-detectable levels of both phosmet and [phosmet] oxon. No phosmet or [phosmet] oxon was found on any of the tee shirt samples" intended to evaluate clothing penetration (i.e., a coverall which is not typically considered as an acceptable risk mitigation option for homeowner exposures).

Transfer coefficients for homeowners were calculated by HED using the human exposure and corresponding dislodgeable foliar residue data. Transfer coefficients were calculated as described in the *Calculations* chapter (Part D, Chapter 2) of the draft *Series 875-Occupational and Residential Exposure Test Guidelines, Group B-Postapplication Exposure Montoring Test Guidelines.* The average transfer coefficient value over all sampling intervals was 5004 cm^2/hour (cv=16.8).

EPA Review Memo From Peg Perreault to Lois Rossi (10/18/91): This review document determined that the submissions were acceptable with two stipulations including: (1) the proposed reentry interval calculations submitted by the registrants were to be revised and (2) a postapplication air monitoring study was to be completed because of the vapor pressure of phosmet.

MRID 425958-01 (Phosmet Dermal Passive Dosimetry Exposure Addendum to MRID 404253-01): The intent of this document was to recalculate restricted entry intervals as required in the HED review of the study (10/18/91). The investigators calculated REIs using the Popendorf default transfer coefficient of 10,000 cm^2/hour and the same dissipation data that HED has used in this risk assessment. The investigators based the calculation on a rabbit 21 day dermal toxicity study (MRID 40538101) in which the NOEL was 100 mg/kg. [Note: The endpoint used by the investigators differs from those specified in the 12/19/97 HAZID document.] The investigators also used an uncertainty factor of 100 instead of the 300 used by HED. The REIs calculated by the investigators include: 66 days for oranges; 25 days for pears; and 8 days for grapes.

MRID 425958-00 (Letter from Gowan Company, Dated December 14, 1992): One of the purposes of this document was to rebut the HED requirement for a postapplication inhalation exposure study using stationary high volume air samplers. The letter indicates "the vapor pressure originally cited in MRID 40425301 was $6x10^{-2}$ microns, not millimeters as indicated" in the 10/18/91 HED study review memo from Peg Perreault. The letter also indicates that "a more recent vapor pressure study (MRID 40344401) calculated a vapor pressure of $4.9x10^{-7}$ torr (mm Hg)." HED concurred with this rebuttal in a memo entitled *Graybeard Data Waivers and Time Extensions - April 20, 1993* (Jeff Evans, HED to Jane Mitchell, SRRD) in which the requirement for this study was dropped.

vii. Postapplication Risk Assessment Assumptions and Factors

A series of assumptions and exposure factors served as the basis for completing both the occupational and homeowner handler risk assessments. Each assumption is detailed below on an individual basis. These include:

- The average body weight of an adult used in all assessments is 70 kg because the NOEL used for the short- and intermediate-term assessments (1.1. mg/kg/day for both scenarios) is based on a chronic oral study and is appropriate to both male and female populations based on the toxicological effect. The average body weight for toddlers used in all assessments is 15 kg based on the *SOPs For Residential Exposure Assessment*.

- For direct pet animal treatments, a range of dog body weights range from 5 lb (min) to 120 lb (max) were used to calculate a "to the animal" application rates which, coupled with the assumptions detailed above from the *SOPs For Residential Exposure Assessment*, were used to calculate total human dose levels (i.e., "to the animal" application rates were used along with a percentage of the amount applied).

- The use of administrative controls (i.e., establishing an REI) are not considered acceptable options for products sold for use by homeowners.

- For the occupational risk assessment, single day exposures were calculated to reflect chemical-specific residue dissipation rates over time coupled with surrogate transfer coefficients of 4,000 and 10,000 cm^2/hour for medium to high exposure activities. It is likely that an occupationally exposed population could be subjected to areas where repetitive applications have occurred thus requiring HED to assess each scenario using identical dose levels (i.e., intermediate-term dose levels are not amortized). In the short-term residential risk assessment for home and garden uses (e.g., pears), HED has calculated single day exposures to reflect chemical-specific residue dissipation rates over time coupled with a chemical-specific transfer coefficients of 5,000 cm^2/hour (2,500 cm^2/hour for children -- calculated by halving the adult transfer coefficient value as was done in the *SOPs For Residential Exposure Assessment* to account for body weight and skin surface area differences). HED believes that repetitive applications will not occur on subsequent days for the extended period in order to trigger an intermediate-term MOE calculated using the peak dose level (i.e., similar approach to short-term assessment). By definition, intermediate-term biological effects are not triggered until sustained exposure at the endpoint dose levels occur. Based on this premise, MOEs for the intermediate-term assessment were calculated using a dose level that was derived by taking the average of the dose levels from applications occurring on a monthly basis (i.e., a 30 day average was used for the intermediate-term assessment, 90 days were not selected as the interval as HED believes applications will occur on a more frequent basis). The approach used by HED is also similar for the residential pet use exposure scenarios.

- The exposure duration for occupationally exposed populations is 8 hours. However, for residential postapplication scenarios, several exposure durations were considered in the development of this risk assessment including 0.67 hours per day engaged in homegardening activities and 2 hours per day for children engaged in hand-to-mouth activity. These values are excerpted from the *SOPs For Residential Exposure Assessment.* In other cases an exposure duration value was not required as the assessment is based on using a simple percentage of the

available residues as the exposure value (i.e., 1 to 10 percent depending upon product formulation).

- Due to a lack of scenario-specific exposure data, HED has calculated unit exposure values for adults using surrogate dermal transfer coefficients that represent reasonable exposures for occupationally exposed populations (i.e., medium exposure potential for row crops of 4,000 cm^2/hour and high exposure activities of 10,000 cm^2/hour). Residential exposures associated with the home garden uses of phosmet were assessed using a chemical-specific transfer coefficient of 5,000 cm^2/hour (½ that for children). Residential pet concerns were assessed based on guidance provided in the *SOPs For Residential Exposure Assessment* (i.e., a percentage of the application rate is available for exposure).

- The available dislodgeable foliar residue data for pears, citrus, and grapes were used to complete all occupational risk assessments and the residential home garden assessment. The grape DFR data were used to evaluate grapes and other low row crops (i.e., different dermal transfer coefficients were used). The pear DFR data were used to assess both occupational pear harvesters and pear maintenance in a residential setting. A dissipation rate of 1 percent per day was assumed for residential pet exposure scenarios. [Note: This is a departure from the *SOPs For Residential Exposure Assessment* that indicate that no dissipation would occur as the objective is to maintain a consistent level to achieve an efficacious dose.]

- Exposure factors, not addressed above, used by HED in this assessment include a method for calculating the application rate to pet animals based on a relationship between skin surface area and weight (*EPA Wildlife Exposure Factors Handbook* as discussed in *SOPs For Residential Exposure Assessment*); hand-to-mouth frequency of 1.56 events per hour; total skin surface area per hand-to-mouth event of 350 cm^2 (i.e., entire surface of both hands); quantitative transfer for each hand-to-mouth event; and infinite replenishment of residues for dermal and hand-to-mouth exposure scenarios in a residential setting.

viii. Occupational Postapplication Risk Assessment

HED determined that there is likely postapplication exposure because phosmet is broadly applied to a variety of agricultural crops for which the cultural practices require human labor to successfully produce the crop. Some exposure scenarios of concern to HED include (this list may not be all inclusive but it represents probably the most significant exposure pathways of concern):

- harvesting fruit and nuts, low-row crops, and grapes;

- pruning and propping (and other maintenance) of fruit and nut trees;

- scouting, weeding, and thinning crops; and

- tree transplanting.

HED believes that post-application exposures due to inhalation will be minimal because of the vapor pressure of phosmet and due to the infinite dilution one would expect outdoors. In addition, non-dietary ingestion was not considered for an occupational population event though it is probably an issue due to poor hygiene practices and smoking. As a result, given the lack of chemical-specific occupational exposure data, only dermal exposures were evaluated for this assessment. Based on the anticipated phosmet use patterns and current labeling, four major postapplication exposure scenarios were modeled using a surrogate approach for each application method and the chemical-specific dislodgeable foliar residue dissipation data described above. These assessments were based on the guidance provided in the *Draft: Series 875-Occupational and Residential Exposure Test Guidelines, Group B-Postapplication Exposure Monitoring Test Guidelines (7/24/97 Version).* The four scenarios assessed include:

(1) adults harvesting and maintaining citrus at the maximum application rate (i.e., orange DFR data, dermal transfer coefficient for harvesting of 10,000 cm^2/hour, and 15 lb ai/A rate not included in handler risk assessment tables);

(2) adults harvesting and maintaining pears at the maximum application rate (i.e., pear DFR data and dermal transfer coefficient for harvesting of 10,000 cm^2/hour);

(3) adults harvesting and maintaining grapes at the maximum application rate (i.e., grape DFR data and dermal transfer coefficient for harvesting of 10,000 cm^2/hour); and

(4) adults harvesting and maintaining citrus at the maximum application rate (i.e., grape DFR data and dermal transfer coefficient for harvesting of 4,000 cm^2/hour).

[Note: The selection of these generic transfer coefficients is in compliance with the HED policy for their use (i.e., based on activity and crop).]

Table 5 in Appendix B presents the results of the quantitative occupational postapplication risk assessment completed by HED. The REIs calculated by HED are based on the same dislodgeable foliar residue data and transfer coefficient that were used by the investigators in MRID 42595801 described above. The REIs calculated by HED include: 347 days for oranges; 77 days for pears; 59 days for grapes; and 45 days for other low-row crops (generated using the grape DFR data as a surrogate not adjusted for application rate). The major difference in the results of the investigators and HED is attributable to the selection of different toxicological endpoints and uncertainty factors (i.e., the approaches used to calculate exposure were similar and based on the same data). [Note: More definitive risk characterization is provided concerning these REIs in Section 4c.]

ix. Residential Postapplication Risk Assessment

HED has determined that there are likely postapplication exposure because phosmet can be applied to a variety of residential settings that may lead to residential exposure (i.e., exposures to sensitive populations). Some exposure scenarios of concern to HED include (this list may not be all inclusive but it represents probably the most significant exposure pathways of concern):

- harvesting homegrown fruit;

- pruning and propping (and other maintenance) of fruit;
- weeding, and thinning crops;
- tree transplanting; and
- contact with treated pets.

HED has determined that there are likely post-application exposures because phosmet is broadly applied to residential and recreational areas. HED believes that post-application exposures due to inhalation will be minimal because of the vapor pressure of phosmet and due to infinite dilution. In addition, non-dietary ingestion (e.g., as a result of toddler hand-to-mouth contact) was not considered. As a result, only dermal exposures were evaluated for this assessment. Based on the anticipated phosmet use patterns and current labeling, four major post-application exposure scenarios were modeled. Two of these scenarios are assessments of exposure to adults while the remaining two scenarios were assessments of exposures to toddlers. These assessments were based on the guidance provided in the *Draft: Series 875-Occupational and Residential Exposure Test Guidelines, Group B-Postapplication Exposure Monitoring Test Guidelines (7/24/97 Version)* and the *Draft: Standard Operating Procedures (SOPs) for Residential Exposure Assessment (12/11/97 Version)*. The four scenarios assessed include:

(1) adults harvesting and maintaining pears at the maximum application rate (i.e., pear DFR data and the chemical-specific dermal transfer coefficient from MRID 40122301 of 5,000 cm^2/hour);

(2) children harvesting and maintaining pears at the maximum application rate (i.e., pear DFR data and the chemical-specific dermal transfer coefficient from MRID 40122301 of 2,500 cm^2/hour);

(3) toddlers after dermal contact with treated pets (i.e., based on the draft *SOPs for Residential Exposure Assessment*); and

(4) hand to mouth dose attributable to toddler contact with treated pets (i.e., based on the draft *SOPs for Residential Exposure Assessment*).

[Note: The selection of these generic transfer coefficients is in compliance with the HED policy for their use (i.e., based on activity and crop) and the draft *SOPs for Residential Exposure Assessment*.]

Tables 6 and 7 in Appendix B present the results of the quantitative occupational postapplication risk assessment completed by HED (Table 6 - homegarden based on pear data, Table 7 - risks associated with pet uses). The REIs calculated by HED are based on the same dislodgeable foliar residue data and transfer coefficient that were used by the investigators in MRID 42595801 described above. MOEs are less than 300 for all scenarios when both short- and intermediate-term assessments are completed (i.e., short-term uses peak dose and intermediate-term uses monthly average dose).

c. Occupational and Residential Risk Assessment/Characterization

The risk assessment completed in Section 4.b is summarized herein. Please refer to the tables presented in Appendices A and B if required as they are the basis for this risk assessment.

i. General Risk Characterization Considerations

Several issues must be considered that pertain to the quality of the assessment and when interpreting the results of the occupational handler and residential postapplication risk assessment. These include:

- No chemical-specific handler exposure data were submitted. As a result, all analyses were completed using surrogate exposure data from sources such as PHED or the *SOPs For Residential Exposure Assessment*. Several handler assessments were completed using "low quality" PHED data due to the lack of a more acceptable dataset (see Exposure Scenario Table in Section 4b for further details). Additionally, in some cases, no empirical data were available for the scenario but an exposure assessment approach was developed and included in the *SOPs For Residential Exposure Assessment* that was appropriate for the assessment. In these cases, the assumptions and approached included in the SOPs served as the basis for the assessment (e.g., pet dipping or dog collar application). The PHED unit exposure values range between the geometric mean and the median of the available exposure data. Factors derived from the *SOPs For Residential Exposure Assessment* are generally considered to be conservative.

- Surrogate dermal transfer coefficients were used to assess occupational postapplication exposures (e.g., grape or citrus harvesting) and to develop residential postapplication exposure estimates for pet use scenarios (i.e., based on the *SOPs For Residential Exposure Assessment*). Chemical-specific postapplication exposure and concurrent dislodgeable foliar residue data were generated for residential home garden scenarios. These data were used to develop dermal transfer coefficients for adults and children engaged in fruit tree maintenance activities. Adult test subjects were utilized in this study and the resulting adult transfer coefficients were scaled down using a surface area and weight relationship to obtain transfer coefficients for children. The activities simulated in this study included pear harvest and tree maintenance (i.e., scale down process was also used in (*SOPs For Residential Exposure Assessment*). The chemical-specific exposure and dislodgeable foliar residue studies were determined to be acceptable by HED. The surrogate transfer coefficients values used to calculate occupational postapplication exposures are based on published empirical data and are generally considered by HED to represent reasonable estimates of dermal exposure. Factors derived from the *SOPs For Residential Exposure Assessment* are generally considered to be conservative. The chemical-specific transfer coefficient was based on calculating the mean of the transfer coefficients for several days of monitoring in the study (i.e., the value is not a conservative representation of the available data).

- Several generic protection factors were used to calculate handler exposures. The protection factors used for clothing layers and gloves have not been completely evaluated by HED. The key element being evaluated by HED is the factor for clothing. The value used for respiratory protection is based on the *NIOSH Respirator Decision Logic* and the value for gloves is in the range that OSHA and NIOSH often use.

- Exposure factors used to calculate daily exposures to handlers are based on the best professional judgement due to a lack of pertinent data and assumptions related to various exposure factors such as the number of animals treated per day, animal sizes to determine application rates, or the number of gallons spray solution prepared and applied for handheld equipment types. The recent

draft NAFTA exposure factor summary (e.g., acres/day/equipment type) was also consulted. These factors are believed to represent reasonable to conservative estimates for calculating exposures.

- Due to a lack of inhalation toxicity endpoints the inhalation doses were added with the dermal doses to produce a total dose. The NOEL was divided by the total dose to arrive at an MOE.

- For lack of appropriate PHED data, only mixer/loader data are used to access the cattle backrubber scenario, the livestock dust bag scenario, and the livestock dipping scenario. This likely underestimates exposure, since no applicator exposure is represented. Additionally, job functions are not combined for some scenarios where field logistics might dictate that a single person would complete all aspects of the application process (e.g., mixer/loaders and groundboom or airblast applications).

- The calculation of hand-to-mouth doses may be based on conservative exposure factors such as infinite replenishment, residue dissipation, surface area, and quantitative replenishment. Conversely, HED believes that the frequency value used to calculating hand-to-mouth doses may underestimate the number of events at peak frequency intervals.

- Calculation of the dose levels for intermediate-term postapplication exposure scenarios in a residential environment involved averaging dose levels over a monthly interval. The duration of this interval was determined based on best professional judgement (i.e., it reflects a monthly chemical application by a commercial service). No use data were available for phosmet that could be used to determine the frequency, number, and typical application rate for phosmet in any exposure scenario.

Refinement of the ORE exposure and risk assessment calculations presented in this chapter is possible if the issues presented above are addressed by the registrant or if more refined approaches and data become available to HED (e.g., research related to toddler hand-to-mouth activity).

ii. Summary of Total Risks to Occupational Handlers

HED identified exposure scenarios based on available labels and other use information such as the LUIS report. As indicated above in section 4.b, surrogate data were used to develop the exposure/risk assessment for occupational handlers (i.e., no chemical-specific data were available). In some cases, appropriate surrogate data were not available to serve as the basis for an assessment. The scenarios for which no appropriate data were available are presented below (for both short- and intermediate-term unless noted):

- (8) the application aspects of livestock dipping using a fill recharge dip vat (mixing/loading aspects of these operations were assessed as scenario 1b);

- (11) dipping pine seedlings;

- (12) mixing/loading/applying with a power duster; and

- (13) application rates could not be determined for dusting cattle with a dust bag.

In cases where appropriate surrogate data were available, a risk assessment was completed. The calculations of short- and intermediate-term total risks (i.e., the toxicological endpoints are the same) indicate that the MOEs are more than 300 at the **baseline clothing** scenario for the following:

- (4) Applying sprays to ornamental trees at an application rate of 1 lb ai/50 gallons using an open cab airblast sprayer at an application rate of 3 lb ai/50 gallons and 50 gallons per day by applying 1.25 gallons per tree (based on medium to high confidence exposure data, a probable extrapolation using airblast data to simulate mistblower applications, a HED estimate for volume/number of trees treated based on best professional judgement, and no use of protection factors);

- (5) Applying sprays with an open cab groundboom sprayer to a variety of agricultural crops at an application rate of 1 lb ai/acre (based on high confidence exposure data, no use of protection factors, and HED/NAFTA exposure factors);

- (13) Dusting an animal in veterinary settings at application rates ranging from 0.0028 to 0.066 lb ai per animal (based on the *SOPs For Residential Exposure Assessment* assumptions and exposure factors, the number of animals per day was based on best professional judgement, the SOP assumptions are believed to lead to a bounding estimate of exposure);

- (14) Dipping an animal in veterinary settings at an application rate of 0.0076 lb ai per animal (based on the *SOPs For Residential Exposure Assessment* assumptions and exposure factors, the number of animals per day was based on best professional judgement, the SOP assumptions are believed to lead to a bounding estimate of exposure);

- (16) Occupational use of dog collars at an application rate of 0.012 lb ai per animal (based on the *SOPs For Residential Exposure Assessment* assumptions and exposure factors, the number of animals per day was based on best professional judgement, the SOP assumptions are believed to lead to a bounding estimate of exposure);

- (17a) Mixing/loading/applying liquids with a backpack sprayer at an application rate of 0.4 lb ai/100 gallon applied to a small herd of livestock (100 cattle) and at an application rate of 0.75 lb ai/100 gallon applied to ornamentals (based on low to medium confidence exposure data, a probable extrapolation using backpack data to treat a small herd of cattle, a HED estimate for number of cattle treated and volume applied based on best professional judgement, and no use of protection factors -- **the exposure estimate includes the use of chemical resistant gloves as it is the only empirical data available**); and

- (17b) Mixing/loading/applying wettable powders with a backpack sprayer at an application rate of 0.75 lb ai/100 gallon applied to ornamentals (based on low to medium confidence exposure data, a probable extrapolation using backpack data for liquids to simulate the use of wettable powders, a HED estimate for volume applied based on best professional judgement, and no use of protection factors -- **the exposure estimate includes the use of chemical resistant gloves as it is the only empirical data available**).

The calculations of short- and intermediate-term total risks indicate that the MOEs are more than 300 with the use of **additional clothing and PPE** for the following scenarios:

- (1a, 1b, 2a, 2b) Mixing/loading liquids for all scenarios including: to support livestock spraying; recharging dip vats; loading airblast sprayers; and supporting high-pressure handwand and right-of-way spraying. Application rates range from 0.4 to 2.0 lb ai/100 gallons with application volumes up to 1000 gallons per day (based on high confidence exposure data, a HED estimate for volume/number of trees treated based on best professional judgement, and the use of protection factors to account for an extra layer of clothing and respiratory protection);

- (3d, 3e) Mixing/loading wettable powders for airblast and for high-pressure handwand/right-of-way sprayer applications to ornamentals based on application rates ranging from 0.75 lb ai/100 gallons to 3 lb ai/50 gallons and application volumes ranging from 50 gallons to 400 gallons (based on low to medium confidence exposure data, a HED estimate for volume/number of trees treated based on best professional judgement, and the use of protection factors to account for an extra layer of clothing and respiratory protection);

- (9) Applying with a high pressure handwand for general targets (e.g., noncrop land) and to ornamentals based on application rates ranging from 0.4 lb ai/100 gallons to 0.75 lb ai/100 gallons and application volumes ranging from 400 gallons to 1000 gallons (based on low confidence exposure data, a HED estimate for volume/number of trees treated based on best professional judgement, and the use of protection factors to account for an extra layer of clothing and respiratory protection);

- (10) Applying with a right-of-way sprayer for to ornamentals based on an application rate of 0.75 lb ai/100 gallons and application volume of 400 gallons (based on low to medium confidence dermal exposure data, a HED estimate for volume/number of trees treated based on best professional judgement, and the use of protection factors to account for an extra layer of clothing and respiratory protection);

- (15) Mixing/loading/applying with a cattle backrubber device at an application rate of 1.0 lb ai/40 gallons (**this assessment should be considered for rangefinder purposes only because the data for mixer/loader liquids has been used as the basis for this assessment and the assessment only represents the backrubber solution preparation and not soaking or placement of such devices,** based on high confidence exposure data, a HED estimate for volume prepared based on best professional judgement, and the use of protection factors to account for an extra layer of clothing and respiratory protection);

- (18a) Mixing/loading/applying liquids with a low pressure handwand sprayer to general targets (i.e., noncrop land), livestock, and ornamentals at application rates ranging from 0.4 to 2.0 lb ai/100 gallons and application volumes ranging from 40 to 100 gallons (based on low to medium confidence exposure data, a HED estimate for volume prepared based on best professional judgement, and the use of protection factors to account for an extra layer of clothing and respiratory protection); and

- (18b) Mixing/loading/applying wettable powders with a low pressure handwand sprayer to ornamentals at a rate 0.75 lb ai/100 gallons and an application volume of 40 gallons (based on medium confidence exposure data, a HED estimate for volume prepared based on best professional judgement, and the use of protection factors to account for an extra layer of clothing and respiratory protection).

The calculations of short- and intermediate-term total risks indicate that the MOEs are more than 300 with the use of **engineering controls coupled with the baseline clothing/PPE scenario** for the following scenarios:

- (3c, 3d, 3f) Mixing/loading wettable powders for groundboom and airblast applications to other targets (e.g., forage and noncrop lands) at an application rate of 1 lb ai per acre and for preparing pine seedling dip solutions at an application rate of 1.75 lb ai/5 gallons (based on low confidence exposure data, a HED/NAFTA estimate for number of acres treated or volume prepared, and the use of no protection factors, **the engineering control used for this scenario is water soluble packets**);

- (4) Applying sprays to "other" targets (e.g., grapes and caneberries) at an application rate of 1 lb ai/acre using a closed cab airblast sprayer (based on high confidence dermal/hand and low confidence inhalation exposure data -- a minimal exposure contributor, a HED/NAFTA estimate for number of acres treated**, no use of protection factors, and the use of chemical resistant gloves -- only empirical exposure data available were with the use of chemical-resistant gloves**);

- (6) Applying sprays to "other" targets (e.g., grapes and caneberries) at an application rate of 1 lb ai/acre, at an acreage of 350 acres per day, using a closed cab, fixed-wing aircraft sprayer (based on medium to high confidence exposure data, a HED/NAFTA estimate for number of acres treated, and no use of protection factors);

- (7) Applying sprays to fruit/nut orchards, "other" targets (e.g., grapes and caneberries), and northwestern forests at application rates ranging from 1 lb ai/acre to 3 lb ai/acre, at acreages ranging from 350 to 1200 (forestry only) acres per day, using a closed cab, helicopter sprayer (based on extremely low confidence exposure data, a HED/NAFTA estimate for number of acres treated, and no use of protection factors); and

- (19) Flagging for aerial spray applications inside a closed cab vehicle during sprays to fruit/nut orchards, "other" targets (e.g., grapes and caneberries), and northwestern forests at application rates ranging from 1 lb ai/acre to 5 lb ai/acre, at acreages ranging from 350 to 1200 (forestry only) acres per day (based on high confidence exposure data, a HED/NAFTA estimate for number of acres treated, and protection factors to account for the use of a closed cab as an engineering control).

Regardless of the level of risk mitigation applied to certain exposure scenarios, MOE values **never exceeded a level of 300**. These scenarios are presented below:

- (3a, 3b, 3d) Mixing/loading wettable powders for aerial and airblast applications to a variety of

targets at application rates up to 5 lb ai/acre (assessments at all risk mitigation levels were based on low to medium confidence exposure data, the use of protection factors in some instances, the maximum application for the variety of crops/targets considered, and an area/volume treated based on HED/NAFTA exposure factors or professional judgement -- **note: some exposures are acceptable in these scenarios, see above for details**);

- (4) Applying sprays to fruit and nuts at application rates of 3 to 5 lb ai/acre using an airblast sprayer (assessments at all risk mitigation levels were based on medium to high confidence dermal/hand and low to high confidence inhalation exposure data -- a minimal exposure contributor, the use of protection factors in some instances, the maximum application for the variety of crops/targets considered, and an area/volume treated based on HED/NAFTA exposure factors or professional judgement -- **note: some exposures are acceptable in this scenario, see above for details**);

- (6) Applying liquid sprays to fruit and nuts at application rates of 3 to 5 lb ai/acre and in forestry applications at an application rate of 1 lb ai/acre using a closed cab, fixed-wing aircraft (engineering controls are the only plausible risk mitigation option as aerial equipment is closed cab, based on medium to high confidence exposure data, no use of protection factors, the maximum application for the variety of crops/targets considered, and an area/volume treated based on HED/NAFTA exposure factors or professional judgement -- **note: some exposures are acceptable in this scenario, see above for details**);

- (7) Applying liquids to fruit and nuts at application rates of 5 lb ai/acre using a closed cab, helicopter (engineering controls are the only plausible risk mitigation option as aerial equipment is closed cab, based on extremely low confidence exposure data, no use of protection factors, the maximum application for the variety of crops/targets considered, and an area/volume treated based on HED/NAFTA exposure factors or professional judgement -- **note: some exposures are acceptable in this scenario, see above for details**);

- (9) Applying liquids to livestock in feedlot scenarios using a high pressure handwand at an application concentration of 1.7 lb ai/gallon and an application volume of 1000 gallons per day (engineering controls are not appropriate for this scenario, assessments at all appropriate risk mitigation levels were based on low confidence exposure data, the use of protection factors in some instances, the maximum application for the variety of crops/targets considered, and an area/volume treated based on HED/NAFTA exposure factors or professional judgement -- **note: some exposures are acceptable in this scenario, see above for details**);

- (17a) Mixing/loading/applying liquids to livestock in feedlot scenarios using a backpack sprayer at an application concentration of 2 lb ai/gallon and an application volume of 40 gallons per day (engineering controls are not appropriate for this scenario, assessments at all appropriate risk mitigation levels were based on low to medium confidence exposure data, the use of protection factors in some instances, the maximum application for the variety of crops/targets considered, and an area/volume treated based on HED/NAFTA exposure factors or professional judgement -- **note: some exposures are acceptable in this scenario, see above for details**); and

- (19) Flagging for aerial spray applications inside a closed cab vehicle during sprays to citrus orchards at an application rate of 15 lb ai/acre and acreages of 350 acres per day (based on high confidence exposure data, a HED/NAFTA estimate for number of acres treated, and protection factors to account for the use of a closed cab as an engineering control). [Note: This scenario is not included in the handler risk assessment tables because the risk picture is so extreme for all application equipment/job functions associated with its use. The MOE value for the 5 lb ai/A use is exactly 300 -- the 15 lb ai/A rate.]

iii. Occupational Risks From Postapplication Exposures

As indicated in Section 4.b above, HED assessed occupational risks from postapplication risks for 4 exposure scenarios using chemical-specific dislodgeable foliar residue dissipation data and surrogate transfer coefficients for harvesting various crops. Restricted entry intervals (REIs) are used by HED to regulate postapplication exposures because HED believes they are the most appropriate risk mitigation option for postapplication exposures. Requirements for additional clothing and PPE are not believed to be appropriate due to practical considerations (e.g., maintenance, enforcement, and other risk/stress factors such as heat exhaustion). Also, engineering controls are not considered practical in all but the most specialized scenarios because they are generally not available for mitigating postapplication risks.

The registrant proposed the following REIs for phosmet based on a toxicological endpoint that was not selected for use by the HED HAZID Committee and essentially the same exposure dataset that was used for the HED risk assessment:

- **Oranges:** 66 days;
- **Pears:** 25 days; and
- **Grapes:** 8 days.

HED calculated REIs for these crops using the same dislodgeable foliar residue data and dermal transfer coefficients that were used by the registrant along with the toxicological endpoints identified by the HED HAZID Committee. [Note: HED also used the grape dissipation data coupled with a different transfer coefficient to calculate an REI for low row crops.] The REIs calculated by HED include the following:

- **Oranges:** 347 days (site- and chemical-specific data coupled with a high exposure transfer coefficient of 10,000 cm^2/hour commonly used by HED);
- **Pears:** 77 days (site- and chemical-specific data coupled with a high exposure transfer coefficient of 10,000 cm^2/hour commonly used by HED);
- **Grapes:** 59 days (site- and chemical-specific data coupled with a high exposure transfer coefficient of 10,000 cm^2/hour commonly used by HED); and
- **Low Row Crop:** 45 days (chemical-specific data coupled with a medium exposure transfer coefficient of 4,000 cm^2/hour commonly used by HED).

As indicated above, HED used the same dislodgeable residue dissipation data and surrogate transfer

coefficient that were used by the registrants to calculate the REI values (i.e., for oranges, pears, and grapes). The grape dissipation data were also used, coupled with a different transfer coefficient to calculate an REI for low row crops. **The major difference in the calculations is that the registrants used a 21-day dermal rabbit study with a NOEL of 100 mg/kg/day and an uncertainty factor of 100 while HED used an oral endpoint of 1.1 mg/kg/day, 10 percent dermal absorption factor, and uncertainty factor of 300 for the calculation.** A semilog regression model was used to calculate the best fit dislodgeable foliar residue levels over time in the HED calculation. The correlation coefficient exceeded 0.94 in all cases and the half-lives ranged from approximately 10 days for pears and grapes up to approximately 40 days for citrus. Additionally, in all scenarios modeled by HED, the best fit concentrations used to calculate exposures were at levels that exceeded the limit of quantification for the dislodgeable foliar residue method (i.e., 0.002 $\mu g/cm^2$). Risk managers should consider the practicality of the calculated REIs, particularly for citrus as it is likely that the duration of the REI represents the cropping cycle for the next growing season. This risk assessment should be considered as conservative because the assessment is based on the maximum label application rate for each scenario (or close approximation thereof). The other exposure factors and input parameters should be considered as representing more reasonable or moderate estimates of exposure.

iv. Residential Risks From Postapplication Exposures

Residential risks were assessed for both adults and toddlers based on guidance provided in the *SOPs For Residential Exposure Assessment* and the *Draft: Series 875-Occupational and Residential Exposure Test Guidelines, Group B-Postapplication Exposure Monitoring Test Guidelines (7/24/97 Version)*. HED considered several populations and exposure scenarios in this residential postapplication risk assessment as phosmet can be used in several ways that might potentially create a risk for a residential population. A home garden setting based on pear tree harvesting and maintenance and pet treatments were selected by HED as scenarios that are representative of phosmet risks in the residential environment. For the home and garden use scenario, HED used the chemical-specific exposure and dislodgeable foliar residue data on pears to calculate risks for pear harvesting activities. Risks in home garden scenarios were assessed for adults and children aged 10 to 12 that might reasonably be expected to participate in these activities. Residential risks attributable to nondietary ingestion and dermal exposure were also assessed for toddlers after contact with treated pets based on the guidance provided in the *SOPs For Residential Exposure Assessment* (e.g., 20 percent of the per animal application is considered transferable while 10 percent of the transferable is used to represent dermal dose). One notable exception to the Residential SOPs included allowing for a moderate residue dissipation rate of 1 percent per day on the treated pets. Risks were assessed using small and larger pets as the application rates varied based on the size of the treated animals.

The postapplication residential risk assessment was completed for both the short- and intermediate-term exposures in all scenarios. For the short-term scenarios, the endpoint was compared directly to the daily dose levels calculated over the modeled phosmet dissipation curve. For the intermediate-term scenarios, the endpoint was compared to the 30 day average dose over the modeled phosmet dissipation curve. These assessments should be considered conservative estimates because of the daily exposure durations, use of maximum application rates, methods for calculating monthly average dose, and transfer and unlimited residue replenishment models used to calculate dose due to dermal exposure and nondietary ingestion.

For the short-term assessment where daily dose levels were compared directly to the short-term endpoint, MOEs were not acceptable (MOE 300) for any scenarios even out to 25 days after application which is unacceptable for a residential setting as current policy is based on no risk mitigation options (e.g., an REI would never be applied in a residential setting). The MOEs calculated for each short-term scenario on application day and 25 days after application are presented below:

(1) MOE = 100 for adults harvesting and maintaining pears at the maximum application rate (i.e., pear DFR data and the chemical-specific dermal transfer coefficient from MRID 40122301 of 5,000 cm^2/hour);

(2) MOE = 120 for children harvesting and maintaining pears at the maximum application rate (i.e., pear DFR data and the chemical-specific dermal transfer coefficient from MRID 40122301 of 2,500 cm^2/hour);

(3) MOE = 8 for toddlers after dermal contact with small treated pets and MOE <1 for toddlers after dermal contact with large treated pets (i.e., based on the draft *SOPs for Residential Exposure Assessment*); and

(4) MOE <1 for hand to mouth dose attributable to toddler contact with small or large treated pets (i.e., based on the draft *SOPs for Residential Exposure Assessment*).

For the intermediate-term assessment where 30 day average dose levels were compared directly to the intermediate-term endpoint, MOEs were not acceptable (MOE < 300) for any scenarios (these assessments should be considered conservative estimates because of the daily exposure durations, use of maximum application rates, methods for calculating monthly average dose, and transfer and unlimited residue replenishment models used to calculate dose due to dermal exposure and nondietary ingestion). The MOEs calculated for each intermediate-term scenario are presented below:

(1) $MOE_{(Day\ 0)}$ = 46 and $MOE_{(Day\ 25)}$ = 240 for adults harvesting and maintaining pears at the maximum application rate (i.e., pear DFR data and the chemical-specific dermal transfer coefficient from MRID 40122301 of 5,000 cm^2/hour);

(2) $MOE_{(Day\ 0)}$ = 51 and $MOE_{(Day\ 25)}$ = 270 for children harvesting and maintaining pears at the maximum application rate (i.e., pear DFR data and the chemical-specific dermal transfer coefficient from MRID 40122301 of 2,500 cm^2/hour);

(3) $MOE_{(Day\ 0)}$ = 7 and $MOE_{(Day\ 25)}$ = 8 for toddlers after dermal contact with small treated pets and MOE <1 (Days 0 to 25) for toddlers after dermal contact with large treated pets (i.e., based on the draft *SOPs for Residential Exposure Assessment*); and

(4) MOE <1 (Days 0 to 25) for hand to mouth dose attributable to toddler contact with small or large treated pets (i.e., based on the draft *SOPs for Residential Exposure Assessment*).

v. Incident reports

Insert historical incident report section here from previous HED RED chapter.

vi. Data requirements

Short- and intermediate-term dermal and inhalation exposure assessments were made using PHED Version 1.1 surrogate data since no chemical-specific handler data were submitted. Phosmet-specific handler studies may be required pending the outcome of recommended discussions with the registrants concerning appropriate risk mitigation options.

The Gowan and Zeneca chemical companies are members of the ongoing *Agricultural Reentry Exposure Taskforce (ARTF).* As such, studies are to be completed to enable the Agency to evaluate agricultural exposures due to contact with treated plants (i.e., to generate appropriate activity pattern and transfer coefficient data). Phosmet registrants must also develop a strategy to generate chemical-specific transferable residue data to be used in conjunction with the ARTF database in order for the Agency to complete any exposure/risk assessment.

Additional data may also be required to further assess the use of phosmet in a residential environment to supplement the chemical-specific data already submitted. The Gowan and Zeneca chemical companies are members of the ongoing *Outdoor Residential Exposure Taskforce (ORETF).* As such, studies may be completed to enable the Agency to evaluate outdoor residential exposures due to contact with treated plants if the scope of the ORETF is expanded to include home garden pesticide uses (i.e., to generate appropriate activity pattern and transfer coefficient data). Phosmet registrants may be required to develop a strategy to generate additional chemical-specific data to be used in conjunction with the ORETF database in order for the Agency to complete any exposure/risk assessment.

APPENDIX A

HANDLER RISK ASSESSMENT FOR PHOSMET

Table 1: Baseline Occupational Handler Risk Assessment for Phosmet

Exposure Scenario (Scen.#)	Baseline Dermal Unit Exposure (mg/lb ai)[a]	Baseline Inhalation Unit Exposure (µg/lb ai)[b]	Range of Application Rates (lb ai/unit)[c]	Daily Treated (units/day)[d]	Daily Dermal Exposure (mg/day)[e]	Daily Inhalation Exposure (mg/day)[f]	Absorbed Dermal Dose (mg/kg/day)[g]	Inhalation Dose (mg/kg/day)[h]	Total Daily Dose (mg/kg/day)[i]	Total MOE
Mixer/Loaders										
Mixing/Loading Liquids to Support Livestock Spraying (1a)	2.9	1.2	0.4 1b per 100 gal (general)[(1)]	1,000 gal	12	0.0048	0.017	6.9E-5	0.017	65
			2.0 lb per 100 gal (feedlot)[(1)]	1,000 gal	58	0.024	0.083	3.4E-4	0.083	13
Mixing/Loading Liquids to Fill/Recharge Dip Vat (1b)			0.4 lb per 100gal (general)[(2)]	1,000 gal	12	0.0048	0.017	6.9E-5	0.017	65
			1.7 lb per 100 gal (feedlot)[(2)]	1,000 gal	49	0.020	0.070	2.9E-4	0.070	16
Mixing/Loading Liquids for Airblast Sprayer (2a)			3.0 lb per 50 gal (ornamentals)[(3)]	40 trees and 1.25 gal. per tree	8.7	0.0036	0.012	5.1E-5	0.012	92
Mixing/Loading Liquids for High Pressure Handwand and Rights of Way Sprayer (2b)			0.75 lb per 100 gal (ornamentals)[(3)]	40 trees and 10 gal. per tree	8.7	0.0036	0.012	5.1E-5	0.012	92
Mixing/Loading Wettable Powders (open bag) for Aerial and Chemigation Application (3a)	3.7	43	5 lb/A (fruit)[(4)]	350	6,500	75	9.3	1.1	10	<1
			3 lb/A (fruit/nuts)[(5)]		3,900	45	5.6	0.64	6.2	<1
			1 lb/A (other)[(6)]		1,300	15	1.9	0.21	2.1	<1
Mixing/Loading Wettable Powders (open bag) for Aerial Application (northwest forests) (3b)			1 lb/A (northwest forests)[(6)]	1,200	4,400	52	6.3	0.74	7.0	<1
Mixing/Loading Wettable Powders (open bag) for Groundboom Application (3c)			1 lb/A (other crops)[(6)]	80	300	3.4	0.43	0.049	0.48	2
Mixing/Loading Wettable Powders (open bag) for Airblast Sprayer (3d)			5 lb/A (fruit)[(4)]	40	740	8.6	1.1	0.12	1.2	<1
			3 lb/A (fruit/nuts)[(5)]		440	5.2	0.64	0.073	0.7	2
			1 lb/A (other)[(6)]		150	1.7	0.21	0.024	0.23	5
			3.0 lb per 50 gal (ornamentals)[(7)]	40 trees and 1.25 gal. per tree	11	0.13	0.016	0.0019	0.018	61
Mixing/Loading Wettable Powders (open bag) for High Pressure Handwand and Rights of Way Sprayer (3e)			0.75 lb per 100 gal (ornamentals)[(7)]	40 trees and 10 gal. per tree	11	0.13	0.016	0.0019	0.018	61
Mixing/Loading Wettable Powders for Pine Seedlings (3f)			1.75 lb per 5 gal[(8)]	100 gal	130	1.5	0.19	0.021	0.21	5

Table 1: Baseline Occupational Handler Risk Assessment for Phosmet (continued)

Exposure Scenario (Scen.#)	Baseline Dermal Unit Exposure (mg/lb ai)[a]	Baseline Inhalation Unit Exposure (µg/lb ai)[b]	Range of Application Rates (lb ai/unit)[c]	Daily Treated (units/day)[d]	Daily Dermal Exposure (mg/day)[e]	Daily Inhalation Exposure (mg/day)[f]	Absorbed Dermal Dose (mg/kg/day)[g]	Inhalation Dose (mg/kg/day)[h]	Total Daily Dose (mg/kg/day)[i]	Total MOE
Applicators										
Applying Sprays with an Airblast/ Mistblower Sprayer (4)	0.39	4.5	5 lb/A (fruit)[4]	40	78	0.90	0.11	0.013	0.012	9
			3 lb/A (fruit/nuts)[5]		47	0.54	0.069	0.0077	0.070	16
			1 lb/A (other)[6]		16	0.18	0.023	0.0026	0.026	42
			3.0 lb per 50 gal (ornamentals)[7]	40 trees and 1.25 gal. per tree	1.2	0.014	0.0017	0.00020	0.0019	580
Applying Sprays with a Groundboom Sprayer (5)	0.014	0.74	1 lb/A (other)[6]	80	1.1	0.059	0.0016	0.00084	0.0024	460
Applying Sprays with a Fixed-Wing Aircraft (6)	NF	NF	5 lb/A (fruit)[4]	350	NF	NF	NF	NF	NF	NF
			3 lb/A (fruit/nuts)[5]							
			1 lb/A (other)[6]							
			1 lb/A (northwest forests)[6]	1,200						
Applying Sprays with a Helicopter (7)	NF	NF	5 lb/A (fruit)[4]	350	NF	NF	NF	NF	NF	NF
			3 lb/A (fruit/nuts)[5]							
			1 lb/A (other)[6]							
			1 lb/A (northwest forests)[6]	1,200						
Applying Using a Fill Recharge Dip Vat to Livestock (8)	No Data	No Data	0.4 lb per 100 gal[2]	1,000 gal	No Data	No Data	No Data	No Data	No Data	No Data
			1.7 lb per 100 gal.[2]							
Applying with a High Pressure Handwand (9)	1.8	79	0.4 lb per 100 gal (cattle)[1]	1,000 gal	7.2	0.32	0.010	0.0045	0.015	73
			2 lb per 100 gal (cattle)[1]		36	1.6	0.051	0.023	0.074	15
			0.75 lb per100 gal (ornamentals)[7]	40 trees and 10 gal per tree	5.4	0.24	0.0077	0.0034	0.011	100
Applying with a Rights-of-Way Sprayer (10)	1.3	3.9	0.75 lb per 100 gal (ornamentals)[7]	40 trees and 10 gal per tree	3.9	0.012	0.0056	0.00017	0.0058	190
Dipping Pine Seedlings (11)	No Data	No Data	1.75 lb per 5 gal[8]	100 gal	No Data	No Data	No Data	No Data	No Data	No Data

Table 1: Baseline Occupational Handler Risk Assessment for Phosmet (continued)

Exposure Scenario (Scen.#)	Baseline Dermal Unit Exposure (mg/lb ai)[a]	Baseline Inhalation Unit Exposure (µg/lb ai)[b]	Range of Application Rates (lb ai/unit)[c]	Daily Treated (units/day)[d]	Daily Dermal Exposure (mg/day)[e]	Daily Inhalation Exposure (mg/day)[f]	Absorbed Dermal Dose (mg/kg/day)[g]	Inhalation Dose (mg/kg/day)[h]	Total Daily Dose (mg/kg/day)[i]	Total MOE
Mixer/Loader/Applicators										
Mixing/Loading/Applying with a Power Duster (12)	No data	No Data	0.9 lb/A (grapes)[9]	No Data	No Data	No Data	No Data	No Data	No Data	No Data
			1.5 lb/A (grapes)[9]	No Data	No Data	No Data	No Data	No Data	No Data	No Data
Dusting an Animal (13)	No data	No Data	1 dust bag (cattle)[10]	No Data	No Data	No Data	No Data	No Data	No Data	No Data
	10%[j]	NA	0.0028 lb ai per dog (min)[11]	8 dogs	0.0022 (total exposure)[g]	NA	$3.1e^{-6}$	NA	$3.1e^{-6}$	$3.5e^{5}$
			0.066 lb ai per dog (max)[11]	8 dogs	0.053 (total exposure)[g]	NA	$7.7e^{-5}$	NA	$7.7e^{-5}$	$1.4e^{5}$
Dipping a Dog (14)	10%[j]	NA	0.0076 lb ai/gal [12]	8 gal	0.0061 (total exposure)[g]	NA	$8.6e^{-6}$	NA	$8.6e^{-6}$	$1.2e^{5}$
Mixing/Loading/Applying with a Cattle Backrubber (15)	2.9	1.2	1 lb ai/40 gal fuel oil[13]	40 gal	2.9	0.0012	0.0041	0.000017	0.0041	270
Dog Collar (16)	1%[j]	NA	0.012 lb ai/collar [14]	8 collars	0.00096 (total exposure)[g]	NA	$1.4e^{-6}$	NA	$1.4e^{-6}$	$8.0e^{5}$
Mixing/Loading/Applying Liquids With a Backpack Sprayer (17a)	2.5 (gloves)	30	0.4 lb ai per 100 gal (livestock, general)[1]	100 gal.	1.0	0.012	0.0014	0.00017	0.0016	690
			2 lb ai per 100 gal (livestock, feedlot)[1]		5.0	0.06	0.0071	0.00086	0.0080	140
			0.75 lb ai per 100 gal (ornamental)[3]	40 gal.	0.75	0.009	0.0011	0.00013	0.0012	920
Mixing/Loading/Applying Wettable Powders With a Backpack Sprayer (17b)	2.5 (gloves)	30	0.75 lb ai per 100 gal (ornamental)[7]	40 gal.	0.75	0.009	0.0011	0.00013	0.0012	920

Table 1: Baseline Occupational Handler Risk Assessment for Phosmet (continued)

Exposure Scenario (Scen.#)	Baseline Dermal Unit Exposure (mg/lb ai)[a]	Baseline Inhalation Unit Exposure (µg/lb ai)[b]	Range of Application Rates (lb ai/unit)[c]	Daily Treated (units/day)[d]	Daily Dermal Exposure (mg/day)[e]	Daily Inhalation Exposure (mg/day)[f]	Absorbed Dermal Dose (mg/kg/day)[g]	Inhalation Dose (mg/kg/day)[h]	Total Daily Dose (mg/kg/day)[i]	Total MOE
Mixing/Loading/Applying Liquids With a Low Pressure Sprayer (18a)	100	30	0.4 lb ai per 100 gal (livestock, general) (1)	100 gal.	40	0.012	0.057	0.00017	0.057	19
			2.0 lb ai per 100 gal (livestock, feedlot) (1)		200	0.06	0.29	0.00086	0.29	4
			0.75 lb ai per 100 gal. (ornamental)(3)	40 gal.	30	0.009	0.043	0.00013	0.043	26
Mixing/Loading/Applying Wettable Powders With a Low Pressure Sprayer (18b)	8.6 (gloves)	1,100	0.75 lb ai per 100 gal. (orn)(7)	40 gal	2.6	0.33	0.0037	0.0047	0.0084	130
Flaggers										
Flagging for Aerial Spray Applications (19)	0.011	0.35	5 lb/A (fruit) (4)	350	19	0.61	0.027	0.0087	0.036	31
			3 lb/A (fruit/nuts)(5)		12	0.37	0.017	0.0053	0.022	50
			1 lb/A (other) (6)		3.9	0.12	0.0056	0.0017	0.0073	150
			1 lb/A (northwest forest) (6)	1,200	13	0.42	0.019	0.0060	0.025	44

"No Data" indicates that no appropriate data are available for incorporation into this cell. "NF" indicates that this exposure scenario is not considered feasible by OPP due to engineering or other practical considerations (e.g., open cockpit aerial application scenario is not considered feasible as aircraft appropriate for this use are not manufactured with open cockpits). "NA" indicates that no further risk assessment is required for this scenario (i.e., an appropriate risk level has been attained prior to application of the current mitigation level).

a Baseline dermal unit exposure represents long pants, long sleeved shirt, no gloves, open mixing/loading, open cab application and flaggers. Exceptions, based on available empirical data are noted on an individual basis.

b Baseline inhalation unit exposure represents no respiratory protection.

c Application rates are based on Phosmet labels as described below. Unless otherwise indicated, application rates are in lb ai/acre. According to Phosmet labels, the rates for individual scenarios are presented below:
(1) 0.4 lb/100gal (e.g., the minimum application) and 2 lb/100 gal (e.g., the maximum application) for spraying livestock (e.g., cattle), which is available in an emulsifiable concentrate (EPA Reg. 773-076 and 2724-262).
(2) 0.4 lb/100gal (e.g., the minimum application) and 1.7 lb/100 gal (e.g., the maximum application) for dipping livestock (e.g., cattle), which is available in an emulsifiable concentrate (EPA Reg. 773-076 and 2724-262).
(3) 3.0 lb/50 gal (airblast/mistblower) and 0.75 lb/100 gal. (hydraulic) are the maximum application rates for spraying ornamentals (shade trees, evergreens, ornamental flowering plants, shrubs, and roses) as an emulsifiable concentrate (EPA Reg 10163-171).
(4) 5 lb ai/acre (e.g., high application rate) for fruit crops (i.e., apples and pears) which is available in a wettable powder in open bag (EPA Reg 10163-166, and a wettable powder in water soluble bags (EPA Reg. 10163-184, 10163-175). An application rate for citrus of 15 lb ai/A also exists (EPA Reg 10163-166) but is not included in this table as the 5 lb ai/A application rate does not attain an acceptable level of risk and it is a significantly higher rate than the others presented.
(5) 3 lb ai/acre (e.g., medium application rate) the typical rate for fruit and nut trees, which is available in a wettable powder in open bag (EPA Reg 10163-166, and a wettable powder in water soluble bags (EPA Reg. 10163-184, 10163-175).
(6) 1 lb ai/acre (e.g., the low application rate) for grape crops; field, forage, small fruit,(e.g., blueberries) and vegetable crops (i.e., alfalfa and peas) , field margins, and evergreens in large stands, which are available in a wettable powder in open bag (EPA Regs. 10163-184, 10163-175, 10163-169, 10163-167, 10163-166), and a wettable powder in water soluble bags (EPA Reg. 10163-175). Note these labels also indicate a use for christmas tree plantations and northern forests.
(7) 3.0 lb/50 gal (airblast/mistblower) and 0.75 lb/100 gal. (hydraulic) are the maximum application rates for spraying ornamentals (shade trees, evergreens, and ornamental trees) with the wettable powder formulation in water-soluble bags (EPA Reg 10163-175)
(8) 1.75 lb per 5 gal (e.g., the maximum application) for dipping pine seedlings (EPA Regs 10163-184, 10163-175, 10163-167, 10163-166).
(9) 0.9 to 1.5 lb ai/acre for grapes available as a dust (EPA Reg 10163-168).
(10) 1 dust bag (e.g., the maximum application) for dusting cattle (EPA Reg. 773-77).
(11) 0.5 gm/kg (e.g., the maximum application) for dusting a dog with a minimum weight of 5 lbs and a maximum weight of 120 lbs (EPA Reg. 773-77,2724-277 and 28293-15).
(12) 1 ounce (8.4 lb/gal density; 11.6% ai) of emulsifiable concentrate in one gallon of water is applied to dip for each dog (EPA Regs. 59-238, 2724-169, 773-79, and 2724-277).
(13) 1 gallon is mixed in 40 gallons of fuel oil for a backrubber (EPA Reg 59-235). Mixer/loader data likely under estimates exposure.

Table 1: Baseline Occupational Handler Risk Assessment for Phosmet (continued)

(14) 15% ai (e.g., the maximum application) for a dog collar (EPA Reg. 2724-279).

d Daily acres are from the EPA HED estimates of acreage (or gallons) that could be treated in a single day for each exposure concern. See the text for data and assumptions.

e Daily dermal exposure (mg/day) = Baseline Dermal Unit Exposure (mg/lb ai) * Appl. rate (lb ai/acre, lb ai/gal, etc.) * Acres treated per day (gallons used per day).

f Daily inhalation exposure (mg/day) = Exposure (µg/lb ai) x (1 mg/1000 µg) Conversion x Application Rate (lb ai/acre, lb ai/gal) x Acres treated (gallons used per day).

g Baseline Daily Absorbed Dermal Dose (mg/kg/day)= Daily Dermal Exposure (mg/day)/ Body Weight (70 kg) * Dermal Absorption Rate for Phosmet (10%).

h Baseline Daily Inhalation Dose (mg/kg/day)= Daily Inhalation Exposure (mg/day)/ Body Weight (70 kg)

I Baseline Total Dose (mg/kg/day) = Baseline Daily Absorbed Dermal Dose (mg/kg/day) + Baseline Daily Inhalation Dose (mg/kg/day). Then used to calculate MOE based on a NOEL of 1.1 mg/kg/day and the formula MOE = NOEL (mg/kg/day)/Total Dose (mg/kg/day).

j No PHED data are available; however, the EPA draft of Standard Operating Procedures (SOPs) for Residential Exposure Assessments (July 1997) assumes that the handler is exposed to ten percent (10%) of the active ingredient during application of dusts and dipping, and one percent (1%) of the active ingredient for dog collars. This assumption is actually a combined (dermal and inhalation) exposure estimate.

Table 2: Occupational Handler Risk Assessment for Phosmet With Additional PPE As a Mitigation Measure

Exposure Scenario (Scen. #)	Unit Dermal Exposure (mg/lb ai)[a]	Range of Application Rates (lb ai/unit)[b]	Daily Treated (units/day)[c]	Daily Absorbed Dermal Dose[d] (mg/kg/day)	Total Daily Dose[e] (mg/kg/day)	Total MOE[f]
Mixer/Loaders						
Mixing/Loading Liquids to Support Livestock Spraying (1a)	0.017	0.4 lb per 100 gal (general)[(1)]	1,000 gal	0.000097	0.00011	10,000
		2.0 lb per 100 gal (feedlot)[(1)]	1,000 gal	0.00049	0.00056	2,000
Mixing/Loading Liquids to Livestock Fill/ Recharge Dip Vat (1b)		0.4 lb per 100 gal (general)[(1)]	1,000 gal	0.000097	0.00011	10,000
		1.7 lb per 100 gal (feedlot)[(1)]	1,000 gal	0.00041	0.00047	2,300
Mixing/Loading Liquids for Airblast Sprayer (2a)		3.0 lb per 50 gal (ornamentals)[(5)]	40 trees and 1.25 gal per tree	0.000073	0.000083	$1.3e^{4}$
Mixing/Loading Liquids for High Pressure Handwand and Rights-of-Way Sprayer (2b)		0.75 lb per 100 gal (ornamentals)[(3)]	40 trees and 10 gal per tree	0.000073	0.000083	$1.3e^{4}$
Mixing/Loading Wettable Powders for Aerial and Chemigation Application (3a)	0.13	5 lb/A (fruit)[(4)]	350	0.33	0.55	2
		3 lb/A (fruit/nuts)[(5)]		0.20	0.33	3
		1 lb/A (other)[(6)]		0.065	0.11	10
Mixing/Loading Wettable Powders for Aerial Application (northwest forest) (3b)		1 lb/A (northwest forests)[(6)]	1,200	0.22	0.37	3
Mixing/Loading Wettable Powders for Groundboom Application (3c)		1 lb/A(other)[(6)]	80	0.015	0.025	44
Mixing/Loading Wettable Powders for Airblast/ mistblower Application (3d)		5 lb/A (fruit)[(4)]	40	0.037	0.061	18
		3 lb/A (fruit/nuts)[(5)]		0.022	0.037	30
		1 lb/A (other)[(6)]		0.0074	0.012	92
		3.0 lb per 50 gal (ornamentals)[(7)]	40 trees and 1.25 gal per tree	0.00056	0.00093	1,200
Mixing/Loading Wettable Powders for High Pressure Handwand and Rights of Way Sprayer (3e)		0.75 lb per 100 gal (ornamentals)[(7)]	40 trees and 10 gal per tree	0.00056	0.00093	1,200
Mixing/Loading Wettable Powders for Pine Seedlings (3f)		1.75 lb per 5 gal[(8)]	100 gal	0.0065	0.011	100
Applicators						
Applying Sprays with an Airblast Sprayer (4)	0.22	5 lb/A (fruit)[(4)]	40	0.063	0.066	17
		3 lb/A (fruit/nuts)[(5)]		0.038	0.040	28
		1 lb/A (other)[(6)]		0.013	0.014	79

Table 2: Occupational Handler Risk Assessment for Phosmet With Additional PPE as a Mitigation Measure (continued)

Exposure Scenario (Scen. #)	Unit Dermal Exposure (mg/lb ai)[a]	Range of Application Rates (lb ai/unit)[b]	Daily Treated (units/day)[c]	Daily Absorbed Dermal Dose[d] (mg/kg/day)	Total Daily Dose[e] (mg/kg/day)	Total MOE[f]
		3 lb/ 50 gal (ornamentals)[7]	40 trees and 1.25 gal per tree	NA	NA	NA
Applying Sprays with a Groundboom Sprayer (5)	NA	1 lb/A (other)[6]	80	NA	NA	NA
Applying Sprays with a Fixed-Wing Aircraft (6)	NF	5 lb/A (fruit)[4]	350	NF	NF	
		3 lb/A (fruit/nuts)[5]				
		1 lb/A (other)[6]				
		1 lb/A(northwest forests)[6]	1,200			
Applying Sprays with a Helicopter (7)	NF	5 lb/A (fruit)[4]	350	NF	NF	
		3 lb/A (fruit/nuts)[5]				
		1 lb/A (other)[6]				
		1 lb/A(northwest forests)[6]	1,200			
Applying Using a Fill Recharge Dip Vat to Livestock (8)	No Data	0.4 lb per 100 gal (general)[2]	1,000 gal	No Data	No Data	
		1.7 lb per 100 gal (feedlot)[2]				
Applying with a High Pressure Handwand (9)	0.36	0.4 lb per 100 gal (general)[2]	1,000 gal	0.0021	0.0030	370
		1.7 lb per 100 gal (feedlot)[2]		0.010	0.018	61
		0.75 lb per 100 gal (ornamentals)[7]	40 trees and 10 gal per tree	0.0015	0.0022	500
Applying with a Rights of Way Sprayer to Trees (10)	0.29	0.75 lb per 100 gal (ornamentals)[7]	40 trees and 10 gal per tree	0.0012	0.0013	850
Dipping Pine Seedlings (11)	No Data	1.75 lb per 5 gal	100 gal	No Data	No Data	No Data
Mixer/Loader/Applicators						
Mixing/Loading/Applying with a Power Duster (12)	No Data	0.9 lb/A(grapes)[8]	No Data	No Data	No Data	No Data
		1.5 lb/A(grapes)[8]	No Data	No Data	No Data	No Data
Dusting an Animal (13)	No Data	1 dust bag (cattle)[10]	No Data	No Data	No Data	No Data
		0.0028 lb ai per dog (min)[11]	8 dogs	NA	NA	NA
		0.0066 lb ai per dog (max)[11]	8 dogs	NA	NA	NA
Dipping a Dog (14)	NA	0.0076 lb ai/gal[12]	8 gal	NA	NA	NA
Mixing/Loading/Applying with a Cattle Backrubber (15)	0.017	1 lb ai/40 gal fuel oil[13]	40 gal	$2.4e^{-5}$	$2.7e^{-5}$	40,000

Table 2: Occupational Handler Risk Assessment for Phosmet With Additional PPE as a Mitigation Measure (continued)

Exposure Scenario (Scen. #)	Unit Dermal Exposure (mg/lb ai)[a]	Range of Application Rates (lb ai/unit)[b]	Daily Treated (units/day)[c]	Daily Absorbed Dermal Dose[d] (mg/kg/day)	Total Daily Dose[e] (mg/kg/day)	Total MOE[f]
Dog Collar (16)	NA	0.012 lb ai/collar(14)	8 collars	NA	NA	NA
Mixing/Loading/Applying Liquids with a Backpack Sprayer (17a)	1.6	0.4 lb ai per 100 gal (livestock, general)(1)	100 gal	NA	NA	NA
		2 lb ai per 100 gal (livestock, feedlot)(1)		0.0046	0.0048	230
		0.75 lb ai per 100 gal (ornamental)(3)	40 gal	NA	NA	NA
Mixing/Loading/Applying Wettable Powders with a Backpack Sprayer (17b)	NA	0.75 lb ai per 100 gal (ornamental)(7)	40 gal	NA	NA	NA
Mixing/Loading/Applying Liquid with a Low Pressure Sprayer (18a)	0.36	0.4 lb ai per 100 gal (livestock, general)(1)	100 gal	0.00021	0.00024	4,600
		2 lb ai per 100 gal (livestock, feedlot)(1)		0.0010	0.0012	920
		0.75 lb ai per 100 gal (ornamental)(3)	40 gal	0.00015	0.00018	6,100
Mixing/Loading/Applying Wettable Powders With a Low Pressure Sprayer (18b)	6.2	0.75 lb ai per 100 gal (ornamental)(7)	40 gal	0.0027	0.0036	300

Table 2: Occupational Handler Risk Assessment for Phosmet With Additional PPE as a Mitigation Measure (continued)

Exposure Scenario (Scen. #)	Unit Dermal Exposure (mg/lb ai)[a]	Range of Application Rates (lb ai/unit)[b]	Daily Treated (units/day)[c]	Daily Absorbed Dermal Dose[d] (mg/kg/day)	Total Daily Dose[e] (mg/kg/day)	Total MOE[f]
Flaggers						
Flagging for Aerial Spray Applications (19)	0.011	5 lb/A (fruit)(4)	350	0.028	0.03	37
		3 lb/A (fruit/nuts)(5)		0.017	0.018	61
		1 lb/A (other)(6)		0.0055	0.0059	190
		1 lb/A(northwest forests)(6)	1,200	0.019	0.020	55

"No Data" indicates that no appropriate data are available for incorporation into this cell. "NF" indicates that this exposure scenario is not considered feasible by OPP due to engineering or other practical considerations (e.g., open cockpit aerial application scenario is not considered feasible as aircraft appropriate for this use are not manufactured with open cockpits). "NA" indicates that no further risk assessment is required for this scenario (i.e., an appropriate risk level has been attained prior to application of the current mitigation level).

a PPE dermal unit exposure represents a double layer of clothing and gloves. Unit inhalation exposure values were calculated by applying a 5-fold protection factor to the baseline unit inhalation value presented in Table 1 to account for the use of a dust/mist respirator.

b Application rates are based on Phosmet labels as described below. Unless otherwise indicated, application rates are in lb ai/acre. According to Phosmet labels, the rates for individual scenarios are presented below:
(1) 0.4 lb/100gal (e.g., the minimum application) and 2 lb/100 gal (e.g., the maximum application) for spraying livestock (e.g., cattle), which is available in an emulsifiable concentrate (EPA Reg. 773-076 and 2724-262).
(2) 0.4 lb/100gal (e.g., the minimum application) and 1.7 lb/100 gal (e.g., the maximum application) for dipping livestock (e.g., cattle), which is available in an emulsifiable concentrate (EPA Reg. 773-076 and 2724-262).
(3) 3.0 lb/50 gal (airblast) and 0.75 lb/100 gal. (hydraulic) are the maximum application rates for spraying ornamentals (shade trees, evergreens, ornamental flowering plants, shrubs, and roses) as an emulsifiable concentrate (EPA Reg 10163-171).
(4) 5 lb ai/acre (e.g., high application rate) for fruit crops (i.e., apples and pears) which is available in a wettable powder in open bag (EPA Reg 10163-166, and a wettable powder in water soluble bags (EPA Reg. 10163-184, 10163-175). An application rate for citrus of 15 lb ai/A also exists (EPA Reg 10163-166) but is not included in this table as the 5 lb ai/A application rate does not attain an acceptable level of risk and it is a significantly higher rate than the others presented.
(5) 3 lb ai/acre (e.g., medium application rate) the typical rate for fruit and nut trees, which is available in a wettable powder in open bag (EPA Reg 10163-166, and a wettable powder in water soluble bags (EPA Reg. 10163-184, 10163-175).
(6) 1 lb ai/acre (e.g., the low application rate) for grape crops; field, forage, small fruit,(e.g., blueberries) and vegetable crops (i.e., alfalfa and peas) , field margins, and evergreens in large stands, which are available in a wettable powder in open bag (EPA Regs. 10163-184, 10163-175, 10163-169, 10163-167, 10163-166), and a wettable powder in water soluble bags (EPA Reg. 10163-175). Note these labels also indicate a use for christmas tree plantations and northern forests.
(7) 3.0 lb/50 gal (airblast/mistblower) and 0.75 lb/100 gal. (hydraulic) are the maximum application rates for spraying ornamentals (shade trees, evergreens, and ornamental trees) with the wettable powder formulation in water-soluble bags (EPA Reg 10163-175)
(8) 1.75 lb per 5 gal (e.g., the maximum application) for dipping pine seedlings (EPA Regs 10163-184, 10163-175, 10163-167, 10163-166).
(9) 0.9 to 1.5 lb ai/acre for grapes available as a dust (EPA Reg 10163-168).
(10) 1 dust bag (e.g., the maximum application) for dusting cattle (EPA Reg. 773-77).
(11) 0.5 gm/kg (e.g., the maximum application) for dusting a dog with a minimum weight of 5 lbs and a maximum weight of 120 lbs (EPA Reg. 773-77,2724-277 and 28293-15).

Table 2: Occupational Handler Risk Assessment for Phosmet With Additional PPE as a Mitigation Measure (continued)

(12) 1 ounce (8.4 lb/gal density; 11.6% ai) of emulsifiable concentrate in one gallon of water is applied to dip for each dog (EPA Regs. 59-238, 2724-169, 773-79, and 2724-277).
(13) 1 gallon is mixed in 40 gallons of fuel oil for a backrubber (EPA Reg 59-235). Mixer/loader data likely under estimates exposure.
(14) 15% ai (e.g., the maximum application) for a dog collar (EPA Reg. 2724-279).

c Daily acres are from the EPA HED estimates of acreage (or gallons) that could be treated in a single day for each exposure concern. See the text for data and assumptions.

d Daily Absorbed Dermal Dose (mg/kg/day)= [Unit Dermal Exposure (mg/lb ai) x Maximum Application Rate (lb ai/acre) x Daily Acres Treated x Dermal Absorption (10%)/70 Kg].

e PPE total daily dose= PPE daily absorbed dose (mg/kg/day) + (Baseline daily inhalation dose (mg/kg/day))/5.
[Again note that the daily inhalation dose is calculated based on the values presented in Appendix A/Table 1 coupled with a protection factor of 5 to account for the use of a dust/mist respirator.]

f Total MOE = short-term and intermediate-term NOEL (1.1. mg/kg/day)/total daily dose (mg/kg/day).

Table 3: Occupational Handler Risk Assessment for Phosmet With Engineering Controls as a Mitigation Measure

Exposure Scenario (Scen #)	Unit Dermal Exposure (mg/lb ai)[a]	Unit Inhalation Exposure (µg/lb ai)[b]	Range of Application Rates (lb ai/unit)[c]	Daily Treated (lb ai/unit)[d]	Daily Absorbed Dose [e] (mg/kg/day)	Daily Inhalation Dose [f] (mg/kg/day)	Total Dose[g] (mg/kg/day)	Total MOE[a]
Mixer/Loaders								
Mixing/Loading Liquids to Support Livestock Spraying (1a)	NA	NA	0.4 lb per 100 gal (general)(1)	1,000 gal	NA	NA	NA	NA
		NA	2.0 lb per 100 gal (feedlot)(1)	1,000 gal	NA	NA	NA	NA
Mixing/Loading Liquids to Livestock Fill/ Recharge Dip Vat (1b)	NA	NA	0.4 lb per 100 gal (general)(1)	1,000 gal	NA	NA	NA	NA
		NA	1.7 lb per 100 gal (feedlot)(1)	1,000 gal	NA	NA	NA	NA
Mixing/Loading Liquids for Airblast Sprayer (2a)	NA	NA	3.0 lb per 50 gal (ornamentals)(3)	40 trees and 100 gal per tree	NA	NA	NA	NA
Mixing/Loading Liquids for High Pressure Handwand and Rights-of-Way Sprayer (2b)	NA	NA	0.75 lb per 100 gal (ornamentals)(3)	40 trees and 10 gal per tree	NA	NA	NA	NA
Mixing/Loading Wettable Powders for Aerial and Chemigation Application (3a)	0.021	0.11	5 lb/A (fruit)(4)	350	0.053	0.0028	0.056	20
			3 lb/A (fruit/nuts)(5)		0.032	0.0017	0.034	32
			1 lb/A (other)(6)		0.011	0.00055	0.012	92
Mixing/Loading Wettable Powders for Aerial Application (northwest forets) (3b)			1 lb/A(northwest forests)(6)	1,200	0.036	0.0019	0.038	29
Mixing/Loading Wettable Powders for Groundboom Application (3c)			1 lb/A(other)(6)	80	0.0024	0.00013	0.0025	430
Mixing/Loading Wettable Powders for Airblast Application (3d)			5 lb/A (fruit)(4)	40	0.0060	0.00031	0.0063	170
			3 lb/A (fruit/nuts)(5)		0.0036	0.00019	0.0038	290
			1 lb/A (other)(6)		0.0012	0.000063	0.0013	850
			3.0 lb per 50 gal (ornamentals)(7)	40 trees and 1.25 gal per tree	NA	NA	NA	NA

Table 3: Occupational Handler Risk Assessment for Phosmet With Engineering Controls as a Mitigation Measure (continued)

Exposure Scenario (Scen #)	Unit Dermal Exposure (mg/lb ai)[a]	Unit Inhalation Exposure (µg/lb ai)[b]	Range of Application Rates (lb ai/unit)[c]	Daily Treated (lb ai/unit)[d]	Daily Absorbed Dose [e] (mg/kg/day)	Daily Inhalation Dose [f] (mg/kg/day)	Total Dose[g] (mg/kg/day)	Total MOE[a]
Mixing/Loading Wettable Powders for High Pressure Handwand and Rights of Way Sprayer (3e)	0.021	0.11	0.75 lb per 100 gal (ornamentals)[7]	40 trees and 10 gal per tree	NA	NA	NA	NA
Mixing/Loading Wettable Powders for Pine Seedlings (3f)			1.75 lb per 5 gal	100 gal	0.0011	0.000055	0.0012	950
Applicators								
Applying Sprays with an Airblast Sprayer (4)	0.019 (gloves)	0.45	5 lb/A (fruit)[4]	40	0.0054	0.0013	0.0067	160
			3 lb/A (fruit/nuts)[5]		0.0033	0.00077	0.0041	270
			1 lb/A (other)[6]		0.0011	0.00026	0.0014	790
			3 lb per 50 gal (ornamentals)[7]	40 trees and 1.25 gal per tree	NA	NA	NA	NA
Applying Sprays with a Groundboom Sprayer (5)	NA	NA	1 lb/A (other)[6]	80	NA	NA	NA	NA
Applying Sprays with a Fixed-Wing Aircraft (6)	0.005	0.068	5 lb/A (fruit)[4]	350	0.013	0.0017	0.015	73
			3 lb/A (fruit/nuts)[5]		0.0075	0.0010	0.0085	130
			1 lb/A (other)[6]		0.0025	0.00034	0.0028	390
			1 lb/A(northwest forests)[6]	1,200	0.0086	0.0012	0.0098	110
Applying Sprays with a Helicopter (7)	0.0019	0.0018	5 lb/A (fruit)[4]	350	0.0048	0.000045	0.0048	230
			3 lb/A (fruit/nuts)[5]		0.0029	0.000027	0.0029	380
			1 lb/A (other)[6]		0.00095	9.0E-06	0.00096	1,100
			1 lb/A(northwest forests)[6]	1,200	0.0033	0.000031	0.0033	330
Applying Using a Fill Recharge Dip Vat to Livestock (8)	No Data	No Data	0.4 lb per 100 gal (general)[2]	1,000 gal	No Data	No Data	No Data	No Data
			1.7 lb per 100 gal (feedlot)[2]					
Applying with a High Pressure Handwand (9)	NF	NF	0.4 lb per 100 gal (cattle, general)[2]	1,000 gal	NF	NF	NF	NF
			1.7 lb per 100 gal (cattle, feedlot)[2]		NF	NF	NF	NF

Table 3: Occupational Handler Risk Assessment for Phosmet With Engineering Controls as a Mitigation Measure (continued)

Exposure Scenario (Scen #)	Unit Dermal Exposure (mg/lb ai)[a]	Unit Inhalation Exposure (µg/lb ai)[b]	Range of Application Rates (lb ai/unit)[c]	Daily Treated (lb ai/unit)[d]	Daily Absorbed Dose [e] (mg/kg/day)	Daily Inhalation Dose [f] (mg/kg/day)	Total Dose[g] (mg/kg/day)	Total MOE[a]
			0.75 lb per 100 gal (ornamentals)[7]	40 trees and 10 gal per tree	NF	NF	NF	NF
Applying with a Rights of Way Sprayer to Trees (10)	NF	NF	0.75 lb per 100 gal (ornamentals)[7]	40 trees and 10 gal per tree	NF	NF	NF	NF
Dipping Pine Seedling (11)	NF	NF	1.75 lb per 5 gal	100 gal	NF	NF	NF	NF
Mixer/Loader/Applicators								
Mixing/Loading/Applying with a Power Duster (12)	NF	NF	0.9 lb/A (grapes)[8]	No Data	NF	NF	NF	NF
			1.5 lb/A (grapes)[8]		NF	NF	NF	NF
Dusting an Animal (13)	NF	NF	1 dust bag (cattle)[9]	No Data	NF	NF	NF	NF
			0.00028 lb ai per dog (min)[10]	8 dogs	NF	NF	NF	NF
			0.00066 lb ai per dog (max)[10]	8 dogs	NF	NF	NF	NF
Dipping a Dog (14)	NF	NF	0.0076 lb ai/gal[11]	8 gal	NF	NF	NF	NF
Mixing/Loading/Applying with a Cattle Backrubber (15)	NF	NF	1 gal/40 gal fuel oil[12]	40 gal	NF	NF	NF	NF
Dog Collar (16)	NF	NF	0.012 lb ai/collar[13]	8 collars	NF	NF	NF	NF
Mixing/Loading/Applying Liquids with a Backpack Sprayer (17a)	NF	NF	0.4 lb ai per 100 gal (livestock, general)[1]	100 gal	NF	NF	NF	NF
			2 lb ai per 100 gal (livestock, feedlot)[1]		NF	NF	NF	NF
			0.75 lb ai per 100 gal (ornamental)[3]	40 gal	NF	NF	NF	NF
Mixing/Loading/Applying Wettable Powders with a Backpack Sprayer (17b)	NF	NF	0.75 lb ai per 100 gal (ornamental)[7]	40 gal	NF	NF	NF	NF
Mixing/Loading/Applying Liquid with a Low Pressure Sprayer (18a)	NF	NF	0.4 lb ai per 100 gal (livestock, general)[1]	100 gal	NF	NF	NF	NF
			2 lb ai per 100 gal (livestock, feedlot)[1]		NF	NF	NF	NF
			0.75 lb ai per 100 gal (ornamental)[3]	40 gal	NF	NF	NF	NF

Table 3: Occupational Handler Risk Assessment for Phosmet With Engineering Controls as a Mitigation Measure (continued)

Exposure Scenario (Scen #)	Unit Dermal Exposure (mg/lb ai)[a]	Unit Inhalation Exposure (µg/lb ai)[b]	Range of Application Rates (lb ai/unit)[c]	Daily Treated (lb ai/unit)[d]	Daily Absorbed Dose [e] (mg/kg/day)	Daily Inhalation Dose [f] (mg/kg/day)	Total Dose[g] (mg/kg/day)	Total MOE[a]
Mixing/Loading/Applying Wettable Powders With a Low Pressure Sprayer (18b)	NF	NF	0.75 lb ai per 100 gal (ornamental)[(7)]	40 gal	NF	NF	NF	NF
Flaggers								
Flagging for Aerial Spray Applications (19)	0.0011	0.035	5 lb/A (fruit)[(4)]	350	0.0028	0.00088	0.0037	300
			3 lb/A (fruit/nuts)[(5)]		0.0017	0.00053	0.0022	500
			1 lb/A (other)[(6)]		0.00055	0.00018	0.00073	1500
			1 lb/A (northwest forest)[(6)]	1,200	0.0019	0.00060	0.0025	440

"No Data" indicates that no appropriate data are available for incorporation into this cell. "NF" indicates that this exposure scenario is not considered feasible by OPP due to engineering or other practical considerations (e.g., open cockpit aerial application scenario is not considered feasible as aircraft appropriate for this use are not manufactured with open cockpits). "NA" indicates that no further risk assessment is required for this scenario (i.e., an appropriate risk level has been attained prior to application of the current mitigation level).

a Engineering control dermal unit exposures represent closed mixing, enclosed cockpit, enclosed cab, or some other appropriate engineering control.

b Engineering control inhalation unit exposures represent closed mixing, enclosed cockpit, enclosed cab, or some other appropriate engineering control.

c Application rates are based on Phosmet labels as described below. Unless otherwise indicated, application rates are in lb ai/acre. According to Phosmet labels, the rates for individual scenarios are presented below:
(1) 0.4 lb/100gal (e.g., the minimum application) and 2 lb/100 gal (e.g., the maximum application) for spraying livestock (e.g., cattle), which is available in an emulsifiable concentrate (EPA Reg. 773-076 and 2724-262).
(2) 0.4 lb/100gal (e.g., the minimum application) and 1.7 lb/100 gal (e.g., the maximum application) for dipping livestock (e.g., cattle), which is available in an emulsifiable concentrate (EPA Reg. 773-076 and 2724-262).
(3) 3.0 lb/50 gal (airblast/mistblower) and 0.75 lb/100 gal. (hydraulic) are the maximum application rates for spraying ornamentals (shade trees, evergreens, ornamental flowering plants, shrubs, and roses) as an emulsifiable concentrate (EPA Reg 10163-171).
(4) 5 lb ai/acre (e.g., high application rate) for fruit crops (i.e., apples and pears) which is available in a wettable powder in open bag (EPA Reg 10163-166, and a wettable powder in water soluble bags (EPA Reg. 10163-184, 10163-175). An application rate for citrus of 15 lb ai/A also exists (EPA Reg 10163-166) but is not included in this table as the 5 lb ai/A application rate does not attain an acceptable level of risk except for scenario 19 and it is a significantly higher rate than the others presented (i.e., it will not attain an acceptable level of risk).
(5) 3 lb ai/acre (e.g., medium application rate) the typical rate for fruit and nut trees, which is available in a wettable powder in open bag (EPA Reg 10163-166, and a wettable powder in water soluble bags (EPA Reg. 10163-184, 10163-175).
(6) 1 lb ai/acre (e.g., the low application rate) for grape crops; field, forage, small fruit,(e.g., blueberries) and vegetable crops (i.e., alfalfa and peas) , field margins, and evergreens in large stands, which are available in a wettable powder in open bag (EPA Regs. 10163-184, 10163-175, 10163-169, 10163-167, 10163-166), and a wettable powder in water soluble bags (EPA Reg. 10163-175). Note these labels also indicate a use for christmas tree plantations and northern forests.
(7) 3.0 lb/50 gal (airblast/mistblower) and 0.75 lb/100 gal. (hydraulic) are the maximum application rates for spraying ornamentals (shade trees, evergreens, and ornamental trees) with the wettable powder formulation in water-soluble bags (EPA Reg 10163-175)
(8) 1.75 lb per 5 gal (e.g., the maximum application) for dipping pine seedlings (EPA Regs 10163-184, 10163-175, 10163-167, 10163-166).
(9) 0.9 to 1.5 lb ai/acre for grapes available as a dust (EPA Reg 10163-168).
(10) 1 dust bag (e.g., the maximum application) for dusting cattle (EPA Reg. 773-77).
(11) 0.5 gm/kg (e.g., the maximum application) for dusting a dog with a minimum weight of 5 lbs and a maximum weight of 120 lbs (EPA Reg. 773-77,2724-277 and 28293-15).
(12) 1 ounce (8.4 lb/gal density; 11.6% ai) of emulsifiable concentrate in one gallon of water is applied to dip for each dog (EPA Regs. 59-238, 2724-169, 773-79, and 2724-277).
(13) 1 gallon is mixed in 40 gallons of fuel oil for a backrubber (EPA Reg 59-235). Mixer/loader data likely under estimates exposure.
(14) 15% ai (e.g., the maximum application) for a dog collar (EPA Reg. 2724-279).

Table 3: Occupational Handler Risk Assessment for Phosmet With Engineering Controls as a Mitigation Measure (continued)

d Daily acres are from the EPA HED estimates of acreage (or gallons) that could be treated in a single day for each exposure concern. See the text for data and assumptions.

e Daily absorbed dermal dose (mg/kg/day)= [Unit Dermal Exposure (mg/lb ai) x Maximum Application Rate (lb ai/acre) x Daily Acres Treated x Dermal Absorption (10%)/70 Kg].

f Inhalation dose (mg/kg/day) = unit inhalation exposure (µg/lb ai) x maximum application rate (lb ai/acre) x daily acres treated.

g Total daily dose (mg/kg/day)= daily absorbed dose (mg/kg/day) + daily inhalation dose (mg/kg/day).

h Total MOE= short-term and intermediate-term NOEL (1.1 mg/kg/day)/ total daily dose (mg/kg/day).

Table 4: Occupational Handler Scenario Descriptions for the Use of Phosmet

Exposure Scenario (Number)	Data Source	Standard Assumptions (8-hr work day)	Comments
Mixer/Loader Descriptors			
Mixing/Loading Liquid Formulations (1a/1b/2a/2b)	PHED V1.1 (May 1997 Surrogate Table)	1,000 gallons for livestock spraying and dipping; 40 trees and 100 gallons per tree for spraying shade trees and orchards with an airblast sprayer, high pressure handwand and rights of way sprayer.	**Baseline:** Hands, dermal, and inhalation = acceptable grades. Hands = 53 replicates; Dermal = 71 to 121 replicates; and Inhalation = 85 replicates. High confidence in hand, dermal, and inhalation data. No protection factor was needed to define the unit exposure value. **PPE:** The same dermal data are used as for baseline coupled with a 50% protection factor to account for an additional layer of clothing. A 5-fold PF (e.g. 80% PF) was applied to the baseline inhalation data. Hands = acceptable grades. Hands = 59 replicates. High confidence in hand data. **Engineering Controls:** Not required for assessment.
Mixing/Loading Wettable Powder Formulations (3a/3b/3c/3d/3e/3f)	PHED V1.1 (May 1997 Surrogate Table)	350 acres for aerial and chemigation; 1,200 acres for aerial (northwest forests -- believed to be an acceptable analogy for forestry application scenarios); 80 acres for groundboom; 40 acres and 40 trees (100 gallons per tree) for airblast sprayer; 40 trees and 10 gallons per tree for high pressure handwand and rights of way sprayer, and 100 gallons for pine seedling dip.	**Baseline:** Hands, dermal, and inhalation = ABC grades. Hands = 7 replicates; Dermal = 22 to 45 replicates, and Inhalation = 44 replicates. Low confidence in the dermal/hands data due to the low number of hand replicates. Medium confidence in inhalation data. No protection factor was needed to define the unit exposure value. **PPE:** The same dermal data are used as for baseline coupled with a 50% protection factor to account for an additional layer of clothing. A 5-fold PF (e.g. 80% PF) was applied to the baseline inhalation data. Hands = ABC grades. Hands = 24 replicates. Medium confidence in hand data. **Engineering Controls**: Hand, inhalation, and dermal = ABC grade. Hands = 5 replicates; dermal = 6 to 15 replicates; and inhalation = 12 replicates. Low confidence in the hand, dermal, and inhalation data. No protection factor was needed to define the unit exposure value. Engineering controls are water soluble packets.
Applicator Descriptors			
Applying Sprays with an Airblast Sprayer (4)	PHED V1.1 (May 1997 Surrogate Table)	40 acres and 40 trees (100 gallons per tree) for airblast sprayer	**Baseline:** Dermal and inhalation = acceptable grades. Hands = ABC grades. Hands = 22 replicates, dermal = 32 to 49 replicates, and inhalation = 47 replicates. High confidence in dermal and inhalation data. Medium confidence in hand data. No protection factor was needed to define the unit exposure value. **PPE:** The same dermal data are used as for baseline coupled with a 50% protection factor to account for an additional layer of clothing. A 5-fold PF (e.g. 80% PF) was applied to the baseline inhalation data. Hands = acceptable grades. Hands = 18 replicates. High confidence in hand data. **Engineering Controls:** Hands and dermal = acceptable grade, and inhalation = ABC grade. **Gloves were used coupled with engineering controls since empirical data without gloves were not available and back calculation of gloves to a no glove scenario is believed to give erroneously high (130µg/lb ai) estimates for a closed cab scenarios.** Hands= 20 replicates; dermal = 20 to 30 replicates; and inhalation = 9 replicates. High confidence in hand and dermal data. Low confidence in inhalation data (based on low replicates).
Applying Sprays with a Groundboom Sprayer (5)	PHED V1.1 (May 1997 Surrogate Table)	80 acres	**Baseline**: Hand, dermal, and inhalation = acceptable grades. Hands =29 replicates, dermal = 23 to 42 replicates, and inhalation = 22 replicates. High confidence in hand, dermal, and inhalation data. High confidence in dermal, hands, and inhalation data. No protection factors were needed to define the unit exposure values. **PPE**: Not required for assessment. **Engineering Controls**: Not required for assessment.

Table 4: Occupational Handler Scenario Descriptions for the Use of Phosmet (continued)

Exposure Scenario (Number)	Data Source	Standard Assumptions (8-hr work day)	Comments
Applying Sprays with a Fixed-wing Aircraft (6)	PHED V1.1 (May 1997 Surrogate Table)	350 acres and 1,200 acres for northwest forests (i.e., believed to be an acceptable analogy for forestry application scenarios)	**Engineering Controls:** Hands = acceptable grade, dermal and inhalation = ABC grade. Hands= 34 replicates, dermal = 24 to 48 replicates, and inhalation = 23 replicates. Medium confidence in dermal and inhalation data. High confidence in hand data. No protection factor was needed to define the unit exposure value. **Engineering controls are the only plausible exposure scenario for this application method as open-cab aircraft are not available and not considered a viable application tool.**
Applying Sprays with a Helicopter (7)	PHED V1.1 (May 1997 Surrogate Table)	350 acres and 1,200 acres for northwest forests (i.e., believed to be an acceptable analogy for forestry application scenarios)	**Engineering Controls:** Hands and inhalation= acceptable grade, dermal = C grade. Hands = 2 replicates; dermal = 3 replicates; and inhalation = 3 replicates. Extremely low confidence in dermal, hand, and inhalation data. No protection factor was needed to define the unit exposure value. **Engineering controls are the only plausible exposure scenario for this application method as open-cab aircraft are not available and not considered a viable application tool.**
Applying Using a Fill Recharge Dip Vat to Livestock (8)	No Data	No Data	No Data
Applying with a High Pressure Handwand to Livestock and Ornamentals (9)	PHED V1.1 (May 1997 Surrogate Table)	1,000 gallons for livestock; 40 trees and 10 gallons per tree.	**Baseline:** Hand, dermal, and inhalation = all grades. Hands = 2 replicates; dermal = 9 to 11 replicates; and inhalation = 11 replicates. Low confidence in hand, dermal, and inhalation data. No protection factor was needed to define the unit exposure values. **PPE:** The same dermal data are used as for baseline coupled with a 50% protection factor to account for an additional layer of clothing. A 5-fold PF (e.g. 80% PF) was applied to the baseline inhalation data. Hands = all grades. Hands = 9replicates. Low confidence in hand data. **Engineering Controls:** Not considered feasible for this exposure scenario.
Applying with a Rights-of-Way Sprayer (10)	PHED V1.1 (May 1997 Surrogate Table)	40 trees and 10 gallons per tree	**Baseline**: Dermal = ABC grades. Inhalation and hands = acceptable grade. Hands = 16 replicates; dermal = 4 to 20 replicates; and inhalation = 16 replicates. Low confidence in dermal data. High confidence in hand and inhalation data. No protection factors were needed to define the unit exposure values. **PPE**: The same dermal data are used as for baseline coupled with a 50% protection factor to account for an additional layer of clothing. A 5-fold PF (e.g. 80% PF) was applied to the baseline inhalation data. Hands = acceptable grades. Hands = 4 replicates. Medium confidence in hand data. **Engineering Controls:** Not considered feasible for this exposure scenario.
Dipping Pine Seedlings (11)	No Data	No Data	No Data
Mixing/Loading/Applying with a Power Duster (12)	No Data	No Data	No Data
Mixer/Loader/Applicator Descriptors			

Table 4: Occupational Handler Scenario Descriptions for the Use of Phosmet (continued)

Exposure Scenario (Number)	Data Source	Standard Assumptions (8-hr work day)	Comments
Dusting an Animal (13)	SOPs for Residential Exposure Assessments (7/97)	minimum dog weight (5 lbs) and maximum dog weight (120 lbs). 8 dogs are dusted.	The SOPs For Residential Exposure Assessment served as the basis for this assessment (i.e., the assumptions that were used to predict exposures from pet use products in which a percentage of the application rate is the predictor of potential dermal dose). The scenario is based on the use of a baseline clothing scenario. Calculations in which additional PPE are applied are not appropriate given the basis for the assessment. Additionally, the use of engineering controls are not considered feasible for this exposure scenario.
Dipping a Dog (14)	SOPs for Residential Exposure Assessments (7/97)	one gallon of dip/dog and 8 dogs are dipped.	The SOPs For Residential Exposure Assessment served as the basis for this assessment (i.e., the assumptions that were used to predict exposures from pet use products in which a percentage of the application rate is the predictor of potential dermal dose). The scenario is based on the use of a baseline clothing scenario. Calculations in which additional PPE are applied are not appropriate given the basis for the assessment. Additionally, the use of engineering controls are not considered feasible for this exposure scenario.
Mixing/Loading/Applying with a Cattle Back Rubber (15)	PHED V1.1 (May 1997 Surrogate Table)	40 gallons	No empirical data are available for this scenario. Instead, open mixing/loading of liquids data were used to complete this assessment. This assessment must be considered for use only as a rangefinder using extremely low confidence data because of the extrapolation that has been completed. See the risk characterization discussion presented in Section 4.b. For informational purposes only, a summary of the mixer/loader data are presented above (see 1a/1b/2a/2b above).
Dog Collar (16)	SOPs for Residential Exposure Assessments (7/97)	8 collars	The SOPs For Residential Exposure Assessment served as the basis for this assessment (i.e., the assumptions that were used to predict exposures from pet use products in which a percentage of the application rate is the predictor of potential dermal dose). The scenario is based on the use of a baseline clothing scenario. Calculations in which additional PPE are applied are not appropriate given the basis for the assessment. Additionally, the use of engineering controls are not considered feasible for this exposure scenario.
Mixing/Loading/Applying with a Backpack Sprayer (17a/17b)	PHED V1.1 (May 1997 Surrogate Table)	40 gallons; 100 gallons for livestock spraying	**Baseline:** Dermal and inhalation = acceptable grades. Hands = ABC grades. Dermal = 9 to 11 replicates; hands = 11 replicates; and inhalation = 11 replicates. Medium confidence in dermal and inhalation data. Low confidence in hand data. **The only empirical data that are available are based on the use of chemical-resistant gloves.** It is not appropriate to back-calculate a non-glove hand exposure level for this scenario as it is considered an overestimate of exposure. An extrapolation has also been completed for this scenario as the empirical data are based on the use of liquid formulations and these data have been used to also evaluate the mixer/loader/applicator backpack use of wettable powder formulations. **PPE:** The same dermal data are used as for baseline coupled with a 50% protection factor to account for an additional layer of clothing. A 5-fold PF (e.g. 80% PF) was applied to the baseline inhalation data. **Engineering Controls:** Not considered feasible for this exposure scenario.
Mixing/Loading/Applying Liquids with a Low Pressure Sprayer (18a)	PHED V1.1 (May 1997 Surrogate Table)	40 gallons; 100 gallons for livestock spraying	**Baseline:** Hands = all grades; dermal and inhalation = ABC grades. Dermal = 9 to 80 replicates; hands = 70 replicates; and inhalation = 80 replicates. Medium confidence in inhalation data. Low confidence in dermal and hand data. **PPE**: The same dermal data are used as for baseline coupled with a 50% protection factor to account for an additional layer of clothing. A 5-fold PF (e.g. 80% PF) was applied to the baseline inhalation data. Hand = 10 replicates. Hands= ABC grades Low confidence in hand data. **Engineering Controls:** Not considered feasible for this exposure scenario.

Table 4: Occupational Handler Scenario Descriptions for the Use of Phosmet (continued)

Exposure Scenario (Number)	Data Source	Standard Assumptions (8-hr work day)	Comments
Mixing/Loading/Applying Wettable Powders with a Low Pressure Sprayer (18b)	PHED V1.1 (May 1997 Surrogate Table)	40 gallons	**Baseline:** Dermal and inhalation= ABC grades; and hands = acceptable grades. Dermal = 16 replicates; hands = 15 replicates; and inhalation = 16 replicates. Medium confidence in inhalation, dermal, and hand data. The only empirical data that are available are based on the use of chemical-resistant gloves. It is not appropriate to back-calculate a non-glove hand exposure level for this scenario as it is considered an overestimate of exposure. **PPE**: The same data are used as for baseline coupled with a 50% protection factor to account for an additional layer of clothing. A 5-fold PF (e.g. 80% PF) was also applied to the baseline inhalation data. **Engineering Controls:** Not considered feasible for this exposure scenario.

Exposure Scenario (Number)	Data Source	Standard Assumptions (8-hr work day)	Comments
Flagger Descriptors			
Flagging Aerial Spray Applications (19)	PHED V1.1 (May 1997 Surrogate Table)	350 acres and 1,200 acres for northwest forests (i.e., believed to be an acceptable analogy for forestry application scenarios)	**Baseline:** Hands, dermal, and inhalation = acceptable grades. Dermal = 18 to 28 replicates; hands = 30 replicates; and inhalation = 28 replicates. High confidence in dermal, hand, and inhalation data. **PPE**: The same dermal data are used as for baseline coupled with a 50% protection factor to account for an additional layer of clothing. A 5-fold PF (e.g. 80% PF) was also applied to the baseline inhalation data. Hand = acceptable grades. Hands= 6 replicates. Low confidence in hand data. **Engineering Controls**: The same data are used as for baseline coupled with a 90% protection factor to account for the use of an engineering control (e.g., sitting in a vehicle).

a All *Standard Assumptions* are based on an 8-hour work day as estimated by HED. BEAD data were not available.

b All handler exposure assessments in this document are based on the "Best Available" data as defined by the PHED SOP for meeting Subdivision U Guidelines (i.e., completing exposure assessments). Best available grades are assigned to data as follows: matrices with A and B grade data (i.e., Acceptable Grade Data) and a minimum of 15 replicates; if not available, then grades A, B and C data and a minimum of 15 replicates; if not available, then all data regardless of the quality (i.e., All Grade Data) and number of replicates. High quality data with a protection factor take precedence over low quality data with no protection factor. Generic data confidence categories are assigned as follows:

High = grades A and B and 15 or more replicates per body part
Medium = grades A, B, and C and 15 or more replicates per body part
Low = grades A, B, C, D and E or any combination of grades with less than 15 replicates.

c **PHED grading criteria do not reflect overall quality of the reliability of the assessment. Sources of the exposure factors should also be considered in the risk management decision.**

Table 5: Residential Handler Risk Assessment for Phosmet

Exposure Scenario (Scen.#)	Baseline Dermal Unit Exposure (mg/lb ai)[a]	Baseline Inhalation Unit Exposure (µg/lb ai)[b]	Range of Application Rates[c]	Daily Treated[d]	Daily Dermal Exposure (mg/day)[e]	Daily Inhalation Exposure (mg/day)[f]	Absorbed Dermal Dose (mg/kg/day)[g]	Inhalation Dose (mg/kg/day)[h]	Total Daily Dose (mg/kg/day)[i]	Total MOE[j]
Mixer/Loader/Applicator Exposure										
Dusting a Dog (1)	10%[k]	No Data	0.0028 lb ai per dog [(2)]	1 dog	0.00028	No Data	$4.0e^{-7}$	No Data	$4.0e^{-7}$	$2.8e^{6}$
			0.066 lb ai per dog [(2)]		0.0066		$9.4e^{-6}$		$9.4e^{-6}$	$1.2e^{5}$
Dipping a Dog (2)	10%[k]	No Data	0.0076 lb ai/gal [(3)]	1 gal.	0.00076	No Data	$1.1e^{-6}$	No Data	$1.1e^{-6}$	$1.0e^{6}$
Dog Collar (3)	1%[k]	No Data	0.012 lb ai per collar [(4)]	1 collar	0.00012	No Data	$1.7e^{-7}$	No Data	$1.7e^{-7}$	$6.4e^{6}$
Mixing/Loading/Applying Liquids with a Backpack Sprayer (4a)	5.1	30	0.0075 lb ai/gal. (orn.) [(5)]	5 gal.	0.19	0.0011	0.00027	0.000016	0.00029	3,800
Mixing/Loading/Applying Wettable Powders with a Backpack Sprayer (4b)	5.1	30	0.01 lb ai/gal. (orn.) [(6)]	5 gal.	0.25	0.015	0.00036	0.000021	0.00038	2,900
			0.012 lb ai/100 ft^2 (peas) [(7)]	150 sq ft.	0.045	0.00054	0.000064	$7.7e^{-6}$	0.000072	15,000
			0.012 lb ai/100 ft^2 (potato) [(7)]	250 sq ft.	0.075	0.00090	0.00011	0.000013	0.00012	9,200
			0.0098 lb ai/gal (fruit) [(8)]	5 gal	0.25	0.0015	0.00036	0.000021	0.00038	2,900
Mixing/Loading/Applying Liquids with a Low Pressure Handwand (5a)	100	30	0.0075 lb ai/gal (orn.) [(5)]	5 gal	3.8	0.0011	0.0054	0.000016	0.0054	203
Mixing/Loading/Applying Wettable Powders with a Low Pressure Handwand (5b)	250	1,100	0.01 lb ai/gal (orn.) [(6)]	5 gal.	13	0.055	0.018	0.00079	0.019	59
			0.012 lb ai/100 ft^2 (peas) [(7)]	150 sq ft.	0.52	0.020	0.00074	0.00029	0.0010	1,100
			0.012 lb ai/100 ft^2 (potato) [(7)]	250 sq ft.	0.87	0.033	0.0012	0.00047	0.0017	650
			0.0098 lb ai/gal (fruit) [(8)]	5 gal	12	0.054	0.018	0.00077	0.019	59
Mixing/Loading/Applying Liquids with a Garden Hose-End Sprayer (6a)	30	9.5	0.0075 lb ai/gal (orn.) [(5)]	5 gal	1.1	0.00036	0.0016	$5.1e^{-6}$	0.0016	690
Mixing/Loading/Applying Wettable Powders with a Garden Hose-End Sprayer (6b)	30	9.5	0.001 lb ai/gal (orn.) [(6)]	5 gal	0.15	0.000048	0.00021	$6.9e^{-7}$	0.00021	5200
			0.0098 lb ai/gal (fruit) [(8)]	5 gal	1.5	0.00047	0.0021	$6.7e^{-6}$	0.0021	520

a Residential handler dermal unit exposure represents short pants, short-sleeved shirt, no gloves, and open mixing/loading. SOP values are based on a similar scenario.

b Residential handler inhalation unit exposure represents no respirator.

c Application rates are based on Phosmet labels as described below. Unless otherwise indicated, application rates are in lb ai/acre. According to Phosmet labels, the rates for individual scenarios are presented below:
(1) 1.5 lb ai/acre (e.g., the maximum application) for grapes available as dust. 0.0125 lb ai per 50 lb (e.g., the maximum application) for sweet potatoes available as dust (EPA Reg 10163-168).
(2) 0.5 gm/kg (e.g., the maximum application) for dusting a dog with a minimum weight of 5 lbs and a maximum weight of 120 lbs (EPA Regs 773-77, 2724-277, and 28293-15).
(3) 1 ounce (8.4 lb/gal density; 11.6% ai) of emulsifiable concentrate in one gallon of water is applied to each dog (EPA Regs. 59-238, 2724-169, 773-79, and 2724-277).
(4) 15% ai (e.g., the maximum application) for a flea collar (EPA Reg 2724-279).

(5) 0.75 lb ai/100 gal. (e.g., the maximum application) for spraying ornamentals (shade trees, evergreens, ornamental flowering plants, shrubs, and roses) as an emulsifiable concentrate (EPA Reg. 10163-171).
(6) 1.0 lb ai/100 gal. (e.g., the maximum application) for applicators applying in parks, neighborhoods, and to property (EPA Reg 10163-170).
(7) 0.012 lb per 100 sq. feet (e.g., the maximum application) for homeowner vegetable crops (peas and potatoes) (EPA Reg 10163-170).
(8) 0.0098 lb ai/gal (e.g., the maximum application) for homeowner fruits, nuts, and ornamentals (EPA Reg 10163-170).

d Amount applied varies from gallons, square feet, number of dogs, etc.

e Daily Dermal Dose (mg/day) = Exposure (mg/lb ai) * Appl. rate (lb ai/gal) * Amount applied (gal/day).

f Daily Inhalation Exposure (mg/day) = Exposure (µg/lb ai) * (1 mg/1000 µg) Conversion * Application Rate (lb ai/gal) * Amount applied (gal/day).

g Daily Absorbed Dose (mg/kg/day) = Daily Dermal Exposure (mg/day) / Body Weight (70 kg) * Daily Absorption Rate for Phosmet (10%).

h Daily Inhalation Dose (mg/kg/day) = Daily Inhalation Exposure (mg/day)/ Body Weight (70 kg).

I Baseline Daily Total Dose (mg/kg/day)= Baseline Daily Absorbed Dose (mg/kg/day) + Baseline Daily Inhalation Dose (mg/kg/day).

j Total MOE= short-term and intermediate NOEL (1.1 mg/kg/day)/ Total Daily Dose (mg/kg/day).

k No PHED data are available; however, the EPA draft of Standard Operating Procedures (SOPs) for Residential Exposure Assessments (July 1997) assumes that the handler is exposed to ten percent (10%) of the active ingredient during applications of dusts and dipping, and one percent (1%) of the active ingredient for dog collars. This assumption is actually a combined (dermal and inhalation) exposure estimate.

Table 6: Residential Handler Scenario Descriptions for the Use of Phosmet

Exposure Scenario (Number)	Data Source	Standard Assumptions (8-hr work day)	Comments[a]
Mixer/Loader/Applicator Descriptors			
Dusting an Animal (1)	SOPs for Residential Exposure Assessments (7/97)	minimum dog weight (5 lbs) and maximum dog weight (120 lbs), 1 dog is dusted	The SOPs For Residential Exposure Assessment served as the basis for this assessment (i.e., the assumptions that were used to predict exposures from pet use products in which a percentage of the application rate is the predictor of potential dermal dose). The scenario is based on the use of a residential clothing scenario (i.e., short pants, short-sleeved shirt, no gloves, no respirator). Note that the same value is used as for the occupational handler scenarios. The refinement of the SOPs for Residential Exposure Assessment is such that furhter delineation based on clothing scenario is not appropriate (i.e., to alter value based on use of short vs. long pants and long-sleeved vs. short-sleeved shirts).
Dipping a Dog (2)	SOPs for Residential Exposure Assessments (7/97)	one gallon of dip and 1 dog is dipped	The SOPs For Residential Exposure Assessment served as the basis for this assessment (i.e., the assumptions that were used to predict exposures from pet use products in which a percentage of the application rate is the predictor of potential dermal dose). The scenario is based on the use of a residential clothing scenario (i.e., short pants, short-sleeved shirt, no gloves, no respirator). Note that the same value is used as for the occupational handler scenarios. The refinement of the SOPs for Residential Exposure Assessment is such that furhter delineation based on clothing scenario is not appropriate (i.e., to alter value based on use of short vs. long pants and long-sleeved vs. short-sleeved shirts).
Dog Collar (3)	SOPs for Residential Exposure Assessments (7/97)	1 collar	The SOPs For Residential Exposure Assessment served as the basis for this assessment (i.e., the assumptions that were used to predict exposures from pet use products in which a percentage of the application rate is the predictor of potential dermal dose). The scenario is based on the use of a residential clothing scenario (i.e., short pants, short-sleeved shirt, no gloves, no respirator). Note that the same value is used as for the occupational handler scenarios. The refinement of the SOPs for Residential Exposure Assessment is such that further delineation based on clothing scenario is not appropriate (i.e., to alter value based on use of short vs. long pants and long-sleeved vs. short-sleeved shirts).
Mixing/Loading/Applying with a Backpack Sprayer (4a\4b)	PHED V1.1 (7/97 Residential SOP Surrogate Table)	5 gallons	Inhalation and dermal = acceptable grades. Hand data = C grade. Dermal = 9 to 11 replicates, hand = 11 replicates, and inhalation = 11 replicates. Medium confidence in dermal and inhalation data. Low confidence in hand data. **Hand exposure values were back-calculated using empirical data that were generated using chemical-resistant gloves and a 90 percent protection factor. An additional 10x safety factor was applied to the hand exposure value because the calculated hand exposure value did not correspond to the level expected given the other dermal exposure values for the scenario (the 10x factor addition was completed based on instructions contained in the Residential SOPs).** Application of risk mitigation measures is inappropriate for residential handler exposure scenarios. The exposure values represent a residential handler clothing scenario.
Mixing/Loading/Applying Liquids with a Low Pressure Sprayer (5a)	PHED V1.1 (7/97 Residential SOP Surrogate Table)	5 gallons	Hands = all grades; dermal and inhalation = ABC grades. Dermal = 9 to 80 replicates; hand = 70 replicates; and inhalation = 80 replicates. Low confidence in dermal and hand data. Medium confidence in inhalation data. Application of risk mitigation measures is inappropriate for residential handler exposure scenarios. The exposure values represent a residential handler clothing scenario.
Mixing/Loading/Applying Wettable Powders with a Low Pressure Sprayer (5b)	PHED V1.1 (7/97 Residential SOP Surrogate Table)	5 gallons	Dermal, inhalation, and hand data are = ABC grade. Dermal = 16 replicates; hand = 16 replicates, and inhalation = 16 replicates. Medium confidence in dermal and inhalation data. Extremely low confidence in hand data, in fact it should be considered for rangefinder purposes only because empirical hand monitoring data were only available with chemical-resistant gloves. These data were used to back calculate a bare-handed exposure value using the 90 % protection factor that is commonly applied to account for the use of gloves. Application of risk mitigation measures is inappropriate for residential handler exposure scenarios. The exposure values represent a residential handler clothing scenario.

Table 6: Residential Handler Scenario Descriptions for the Use of Phosmet (continued)

Exposure Scenario (Number)	Data Source	Standard Assumptions (8-hr work day)	Comments[a]
Mixing/Loading/Applying Liquids and Wettable Powders with a Garden Hose-End Sprayer (6a/6b)	PHED V1.1 (7/97 Residential SOP Surrogate Table)	5 gallons	Dermal and inhalation = C grade. Hand = E grade. Dermal = 8 replicates; hands = 8 replicates; and inhalation = 8 replicates. Low confidence in all data. An extrapolation has been completed for this scenario as the empirical data are based on the use of liquid formulations and these data have been used to also evaluate the mixer/loader/applicator hose-end sprayer use of wettable powder formulations. Application of risk mitigation measures is inappropriate for residential handler exposure scenarios. The exposure values represent a residential handler clothing scenario.

a All *Standard Assumptions* are based on an 8-hour work day as estimated by HED. BEAD data were not available.

b All handler exposure assessments in this document are based on the "Best Available" data as defined by the PHED SOP for meeting Subdivision U Guidelines (i.e., completing exposure assessments). Best available grades are assigned to data as follows: matrices with A and B grade data (i.e., Acceptable Grade Data) and a minimum of 15 replicates; if not available, then grades A, B and C data and a minimum of 15 replicates; if not available, then all data regardless of the quality (i.e., All Grade Data) and number of replicates. High quality data with a protection factor take precedence over low quality data with no protection factor. Generic data confidence categories are assigned as follows:

High = grades A and B and 15 or more replicates per body part
Medium = grades A, B, and C and 15 or more replicates per body part
Low = grades A, B, C, D and E or any combination of grades with less than 15 replicates.

c **PHED grading criteria do not reflect overall quality of the reliability of the assessment. Sources of the exposure factors should also be considered in the risk management decision.**

APPENDIX B

POSTAPPLICATION RISK ASSESSMENT FOR PHOSMET

Appendix B/Table 1 : Dislodgeable Foliar Residue Data for Oranges Excerpted From MRID 404253-01

Days After Treatment	Plot 1			Plot 2			Combined
	Phosmet Residue ($\mu g/cm^2$)	Phosmet Equiv. Oxon Residue ($\mu g/cm^2$)	Sum ($\mu g/cm^2$)	Phosmet Residue ($\mu g/cm^2$)	Phosmet Equiv. Oxon Residue ($\mu g/cm^2$)	Sum ($\mu g/cm^2$)	Average ($\mu g/cm^2$)
0	10.8	0.081	10.88	12.5	0.096	12.60	12
1	11.4	0.18	11.58	10.1	0.17	10.27	11
3	10.4	0.22	10.62	9.9	0.19	10.09	10
5	11.1	0.36	11.46	9.7	0.42	10.12	11
7	9.8	0 .36	10.16	9.2	0.38	9.58	9.9
10	9.4	0.47	9.87	8.1	0.44	8.54	9.2
14	8.8	0.56	9.36	7.8	0.71	8.51	8.9
21	7.9	0.61	8.51	6.7	0.61	7.31	7.9
28	6.7	0.66	7.36	6.2	0.66	6.86	7.1

The limit of quantification for the phosmet dislodgeable foliar residue method is 0.002 $\mu g/cm^2$. The application rate in this study was 30 lb 50 WP/acre (i.e., 15 lb ai/acre) which is the current label maximum application rate. The sample size for this study was 480 cm^2/sample (i.e., 48 - 1 inch diameter leaf punches). Field recovery data were generated for both phosmet (84.4 %, CV 15.6, n 18) and phosmet oxon (89.6 %, 15.7, n 18). Phosmet oxon levels are presented as equivalents of the phosmet parent molecule which were calculated by using the empirically determined [oxon] and multiplying it by the ratio of the LD_{50} for the oxon/LD_{50} for phosmet parent.

Appendix B/Table 2 : Dislodgeable Foliar Residue Data for Pears Excerpted From MRID 404253-01

Days After Treatment	Plot 2		
	Phosmet Residue ($\mu g/cm^2$)	Phosmet Equiv. Oxon Residue ($\mu g/cm^2$)	Sum ($\mu g/cm^2$)
0	5.0	0.04	5.04
1	5.9	0.05	5.95
2	4.6	0.04	4.64
3	4.6	0.05	4.65
4	4.4	0.04	4.44
5	4.1	0.06	4.16
7	3.7	0.06	3.76
10	3.5	0.06	3.56
14	2.0	0.06	2.06
21	1.1	0.03	1.03
28	1.0	0.02	1.02

The limit of quantification for the phosmet dislodgeable foliar residue method is 0.002 $\mu g/cm^2$. The application rate in this study was 10 lb 50 WP/acre (i.e., 5 lb ai/acre) which is the current label maximum application rate. The sample size for this study was 480 cm^2/sample (i.e., 48 - 1 inch diameter leaf punches). Field recovery data were generated for both phosmet (82.5 %, CV 9.3, n 8) and phosmet oxon (93.2 %, CV 7.0, n 10). Laboratory recoveries were similar to the field recovery. Phosmet oxon levels are presented as equivalents of the phosmet parent molecule which were calculated by using the empirically determined [oxon] and multiplying it by the ratio of the LD_{50} for the oxon/LD_{50} for phosmet parent. These data are used to assess both occupational and homeowner exposures.

Appendix B/Table 3 : Dislodgeable Foliar Residue Data for Grapes Excerpted From MRID 404253-01

Days After Treatment	Plot 1			Plot 2			Combined
	Phosmet Residue ($\mu g/cm^2$)	Phosmet Equiv. Oxon Residue ($\mu g/cm^2$)	Sum ($\mu g/cm^2$)	Phosmet Residue ($\mu g/cm^2$)	Phosmet Equiv. Oxon Residue ($\mu g/cm^2$)	Sum ($\mu g/cm^2$)	Average ($\mu g/cm^2$)
0	2.2	0.03	2.23	1.2	0.02	1.22	1.7
1	1.0	0.07	1.07	1.3	0.06	1.36	1.2
3	0.61	0.1	0.71	1.1	0.1	1.2	0.96
4	0.84	0.13	0.97	0.61	0.1	0.71	0.84
6	1.0	0.17	1.17	0.62	0.13	0.75	0.96
9	0.48	0.11	0.99	0.73	0.13	0.86	0.93
13	0.41	0.1	0.51	0.61	0.12	0.73	0.62
20	0.24	0.06	0.3	0.12	0.04	0.16	0.23
27	0.27	0.08	0.35	0.14	0.05	0.19	0.27

The limit of quantification for the phosmet dislodgeable foliar residue method is 0.002 $\mu g/cm^2$. The application rate in this study was 2 lb 50 WP/acre (i.e., 1 lb ai/acre). The sample size for this study was 480 cm^2/sample (i.e., 48 - 1 inch diameter leaf punches). Field recovery data were generated for both phosmet (96.9 %, CV 6.4, n 7) and phosmet oxon (98.0 %, CV 5.2, n 9). Laboratory recoveries were similar to the field recovery. Phosmet oxon levels are presented as equivalents of the phosmet parent molecule which were calculated by using the empirically determined [oxon] and multiplying it by the ratio of the LD_{50} for the oxon/LD_{50} for phosmet parent.

Appendix B/Table 4: Empirical Dermal Exposure Data For Homeowners From MRID 401223-01 and Transfer Coefficient Calculation Based on MRID 404253-01

Days After Treatment (DAT)	Dermal Exposure (mg phosmet/30 minute replicate)[a]			DFR (μg/cm^2)			Transfer Coefficient (cm^2/hr) [c]
	Head & Neck	Hands	Total	Phosmet Residue	Phosmet Equiv. Oxon Residue	Total	
0	0.36	13.2	13.6	5.0	0.04	5.04	5397
1	0.77	13.3	14.1	5.9	0.05	5.95	4739
2	0.57	15.4	16.0	4.6	0.04	4.64	6897
3	0.38	10.4	10.8	4.6	0.05	4.65	4645
4	0.33	10.7	11.0	4.4	0.04	4.44	4955
5	0.31	9.44	9.75	4.1	0.06	4.16	4688
7	0.30	7.52	7.82	3.7	0.06	3.76	4160
14	0.30	4.39	4.69	2.0	0.06	2.06	4553
						Average TC	5004

a Homeowner dermal exposure to phosmet using dermal dosimetry data (MRID # 401223-01). Values presented are averages of the 4 replicates monitored on Days 0 through 7 and the 2 replicates monitored on Day 14.

b DFR phosmet residue to pears (MRID # 404253-01) that were collected concurrently with the dermal exposure data. The DFR values reported are averages of 3 sampling replicates on each day.

c Transfer coefficients were calculated by as follows: total dermal exposure (mg/30 minutes) * 2 (conversion to an hourly exposure rate)* (1,000 ug/mg)/DFR (µg/cm^2)

d Average transfer coefficient is 5004 ± 841 (CV 16.8).

Appendix B/Table 5: Restricted Entry Intervals For Phosmet Calculated For Oranges, Pears, Grapes, and Row Low Crops

Days After Treatment	Best Fit DFR ($\mu g/cm^2$)[a]	Transfer Coefficient (cm^2/hr)[b]	Absorbed Dose (mg/kg/day)[c]	MOE[d]
ORANGES				
0	12.00	10,000	1.4	<1
200	0.39		0.045	25
300	0.071		0.0081	140
347	0.032		0.0036	300
PEARS				
0	5.0	10,000	0.57	2
40	0.36		0.041	27
50	0.18		0.021	52
60	0.095		0.011	100
77	0.031		0.0035	310
GRAPES				
0	1.7	10,000	0.20	6
30	0.22		0.025	44
40	0.11		0.013	86
50	0.057		0.0065	170
59	0.031		0.0035	310
LOW GROWING FRUITS AND VEGETABLES[e]				
0	1.7	4,000	0.077	14
20	0.44		0.020	55
30	0.22		0.010	110
40	0.11		0.0051	220
45	0.079		0.0036	300

a The average dislodgeable foliar residues from the fruit tree study MRID No. 425958-01, DFR ($\mu g/cm^2$) was derived by converting the measured DFR data to lognormal data then running a linear regression to estimate the dissipation over time. The average residues are a combination of phosmet and phosmet oxon.

b Transfer coefficients are generic defaults commonly used by HED. An 8 hour workday is assumed for all occupational postapplication risk assessments.

c Exposure (mg/day) = [(Best Fit DFR x Transfer Coefficient (cm^2/hr))/1000 $\mu g/mg$] x 8 hrs/day & Dose (mg/kg/day) = Exposure (mg/day) x Dermal Absorption (10 %) /70 kg.

d MOE = NOEL (1.1 mg/kg/day) / Dose (mg/kg/day).

e DFR data for grapes was used as a "surrogate" to assess low growing fruit and vegetables.

Table 6: Postapplication Residential Risks to Phosmet After Home Garden Applications

Days After Treatment	Best Fit DFR ($\mu g/cm^2$)[a]	Transfer Coefficient (cm^2/hr)[b]	Absorbed Dose (mg/kg/day)[c]	MOE[d]
Short-Term Adult Exposure Scenario[e]				
0	5.0	5000	0.024	46
5	3.6		0.017	64
10	2.6		0.012	88
20	1.3		0.0064	170
30	0.69		0.0033	330
Short-Term Children Exposure Scenario[e]				
0	5.0	2500	0.022	51
5	3.6		0.016	71
10	2.6		0.011	99
20	1.3		0.0057	190
30	0.69		0.0030	370
Intermediate-Term Adult Exposure Scenario[e]				
30 Day Average	2.2	5000	0.011	100
Intermediate-Term Children Exposure Scenario[e]				
30 Day Average	2.2	2500	0.0095	120

a The average dislodgeable foliar residues are from the chemical-specific data for pears presented in Appendix B/Table 2. DFR ($\mu g/cm^2$) levels were derived by a semilog regression (pseudo first order) analysis of the data. The average residues are a combination of phosmet and its metabolite oxon.

b Transfer coefficients are from the chemical-specific exposure data presented in Appendix B/Table 4. The transfer coefficient used for adults has been derived based on empirical data while the transfer coefficient for children (aged 10 to 12 years) was derived using a method included in the SOPs For Residential Exposure Assessment that indicates that these values are approximately half for children due to skin surface area differences.

c Exposure (mg/day) = [(Best Fit DFR x Transfer Coefficient (cm^2/hr))/1000 $\mu g/mg$] x 0.67 hrs/day & Dose (mg/kg/day) = Exposure (mg/day) x Dermal Absorption (10 %) /70 kg.

d MOE = NOEL (1.1 mg/kg/day)/Dose (mg/kg/day)

e Short-term calculations based on a comparison of daily dose levels to endpoint while intermediate-term calculations based on a comparison to a average monthly dose.

Table 7: Postapplication Residential Risks to Phosmet After Pet Applications

Days After Treatment	Available Phosmet (mg ai/dog)[a]	Exposure Rate (%)[b]	Absorbed Dose (mg/kg/day)[c]	MOE[d]
Short-Term Children Dermal Contact Exposure Scenario[e]				
0	254	10	0.17	7
5	242		0.16	7
10	230		0.15	7
20	208		0.14	8
30	188		0.13	9
Short-Term Children Hand-to-Mouth Exposure Scenario[e]				
0	254	100	9.9	<1
5	242		9.4	<1
10	230		8.9	<1
20	208		8.1	<1
30	188		7.3	<1
Intermediate-Term Children Dermal Contact Exposure Scenario[e]				
30 Day Average	220	10	0.15	8
Intermediate-Term Children Hand-to-Mouth Scenario[e]				
30 Day Average	220	100	8.6	<1

a The available phosmet per dog was calculated based on an application rate to a 5 lb animal (large dogs were also assessed but the risks are not presented as risks for even small dogs are unacceptable). The "Available Phosmet" represents 20 percent of the application rate and is defined as those residues available for transfer from the coat of the animal. Also based on a 1 percent dissipation rate per day that is not included in the *SOPs For Residential Exposure Assessment*.

b The *SOPs For Residential Exposure Assessment* indicate that 10% of available residues equate to the exposure for dermal contact and that 100 percent of available residues are tranferred as dose for every hand-to-mouth event.

c See document text for equations and other exposure factors used to calculate dose levels resulting from dermal contact with treated pets and due to hand-to-mouth events

d MOE = NOEL (1.1 mg/kg/day)/Dose (mg/kg/day)

e Short-term calculations based on a comparison of daily dose levels to endpoint while intermediate-term calculations based on a comparison to a average monthly dose.